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RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION
INTERIM REMEDIAL ACTION
SOILS UNIT
GOULD SITE
PORTLAND, OREGON

0000150

RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

Site

Gould site - Portland, Oregon.

Purpose

This decision document presents the selected interim remedial action for the site, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and consistent with (where not precluded by SARA) the National Contingency Plan (NCP, 40 CFR Part 300). The State of Oregon Department of Environmental Quality concurs with the selected remedy.

Basis for Decision

The decision is based upon the administrative record for the site. This record includes, but is not limited to, the following documents:

- Final Remedial Investigation Report for the Gould site, Portland, Oregon (November 1987)
- Final Feasibility Study Report for the Gould Site, Final Report (February 1988)
- Decision Summary of Remedial Alternative Selection (attached)
- Responsiveness Summary (attached as Appendix B)
- A complete list of documents contained in the Administrative Record is included as Appendix C

Description

This record of decision addresses the soils unit at the Gould site. By doing so the remedy focuses on removing the principal source of lead contamination to the environment. The remedy also includes further study to determine whether additional remedial measures are required for groundwater and surface water at the site.

This remedial action is designed to:

- remove lead from the battery casings through recycling;
- reduce the mobility of lead in the contaminated soil, sediment and matte at the site through fixation;
- continue monitoring of surface water and groundwater at the site while additional study of contamination in these areas is done; and
- monitor ambient air around the site to ensure that remedial actions are carried out in a manner that is protective of public health.

The extent to which lead and other components of the battery casings can be recycled will depend on the results of design work under this remedy. The results of the design studies will be used to determine the recyclability of the battery casings and the protective measures to be employed during remediation. A phased approach, described in the selected remedy, will be employed in the design work.

It is EPA's intent in selecting this remedy to treat all of the battery casings at the site and at the same time minimize the amount of material that must be sent to a RCRA landfill. Should the results of the design phase show that these goals are not compatible, an additional public comment period will be established and this Record of Decision may be modified. At such time, EPA would present for comment additional options for dealing with the treated materials.

Treatment and removal of casings and treatment of soils will remove lead and eliminate potential for exposure due to direct contact and ingestion. Immobilization of lead in soils, sediment and matte will reduce migration of lead as a potential source of further contamination to groundwater and surface water at the site.

Institutional controls will be implemented, during and after remediation. The purpose of these controls will be to assure that the remedial action will protect public health and the environment during its execution, and to ensure a similar level of protection after the remedial actions have been implemented and prior to a final decision at this site.

Declaration

Consistent with CERCLA, as amended by SARA, and the NCP, it is determined that the selected remedy as described above is protective of human health and the environment, attains Federal and State requirements which are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference expressed in SARA for treatment that reduces toxicity, mobility, and volume. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

3-31-88

Date

Regional Administrator
Environmental Protection Agency
EPA - Region 10

DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION
INTERIM REMEDIAL ACTION
SOILS UNIT
GOULD SITE
PORTLAND, OREGON

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I. SITE DESCRIPTION AND BACKGROUND

Site Location and Description

The Gould site is located in the Doane Lake area of Portland between N.W. St. Helens Road and N.W. Front Avenue, about 1.3 miles southeast of St. John's Bridge. The Gould site includes the property presently owned by Gould, along with areas outside the property boundary where battery casings and other residues from operations on the Gould site were placed. Because of the potential for dispersion of contaminants in water, the site also includes the 1963 boundaries of Doane Lake. As shown on Figure 1 (General Vicinity Map), the Willamette River lies about 1,000 feet to the northeast and flows northwest, parallel to Front Avenue. The area is heavily industrialized. The Gould site is only a portion of the 60-acre study area, shown on Figure 2 (Study Area Location Map).

The study area is roughly bounded on the southwest by N.W. St. Helens Road, on the northeast by N.W. Front Avenue, on the southeast by 61st Street, and on the west and northwest by the Burlington Northern railroad right-of-way. Industrial properties adjacent to the Gould site that lie wholly or partly within the study area include American Steel Industries, Inc.; ESCO Corporation; Rhone-Poulenc Inc.; Northwest Equipment Rentals, Inc. (leased from Rhone-Poulenc); Schnitzer Investment Corporation, and Liquid Air Corporation (leased from Schnitzer).

Available aerial photographs taken since 1936, and topographic mapping as early as 1884, indicate that the study area now occupied by Gould property and adjacent industries was formed by gradual and intermittent man made filling of a fairly large body of shallow water known as Doane Lake.

On the current Gould site, a secondary lead smelting facility was completed and went into operation in 1949 under the ownership of Morris P. Kirk and Sons (Kirk & Sons), a subsidiary of NL Industries, Inc. Facility operations consisted of lead-acid battery recycling, lead smelting and refining, zinc alloying and casting, cable sweating (removal of lead sheathing from copper cable), and (after 1965) lead oxide production. NL Industries, Inc. purchased the property from the subsidiary in 1971. The property was sold by NL Industries to Gould, Inc. in January 1979. In October of the same year, Gould stopped receiving lead-acid batteries, but continued to process a substantial existing stockpile of batteries. In January 1980, lead refining operations were discontinued. Battery breaking operations ceased on April 1, 1981, lead oxide production ceased in May 1981, and the facility closed entirely in August 1981. By the summer of 1982, most of the structures, facilities, and equipment had been removed.

In [illegible] EPA and DEQ began investigating the site, and the site was placed on the Superfund National Priorities list in 1983. In 1985 NL Industries and Gould Inc. signed an Order on Consent with EPA under which NL and Gould conducted a Remedial Investigation (RI) and Feasibility Study (FS) at the site. The final RI report was submitted to EPA in November 1987 and the final FS report was submitted in February 1988.

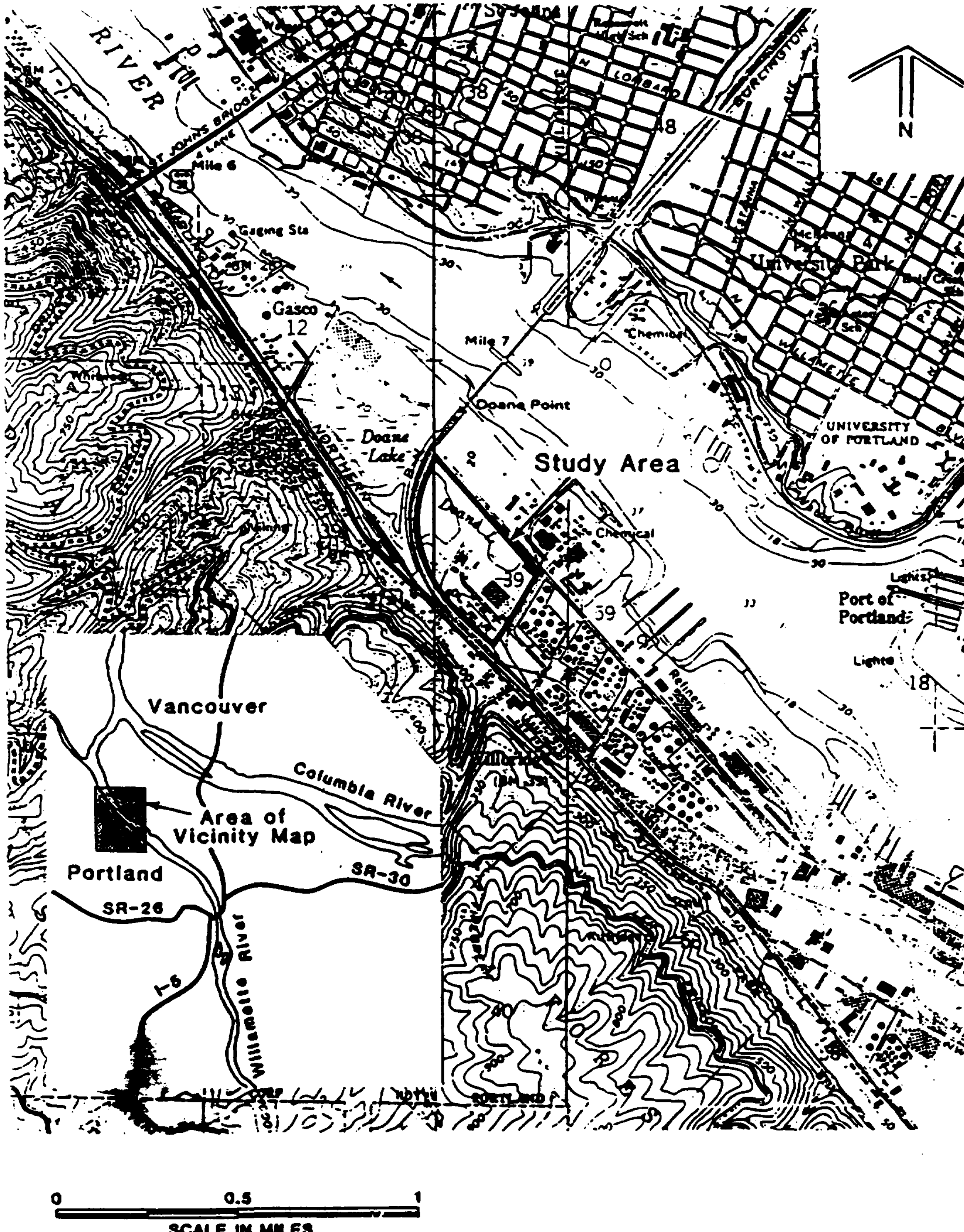

Figure 1

General Vicinity Ma

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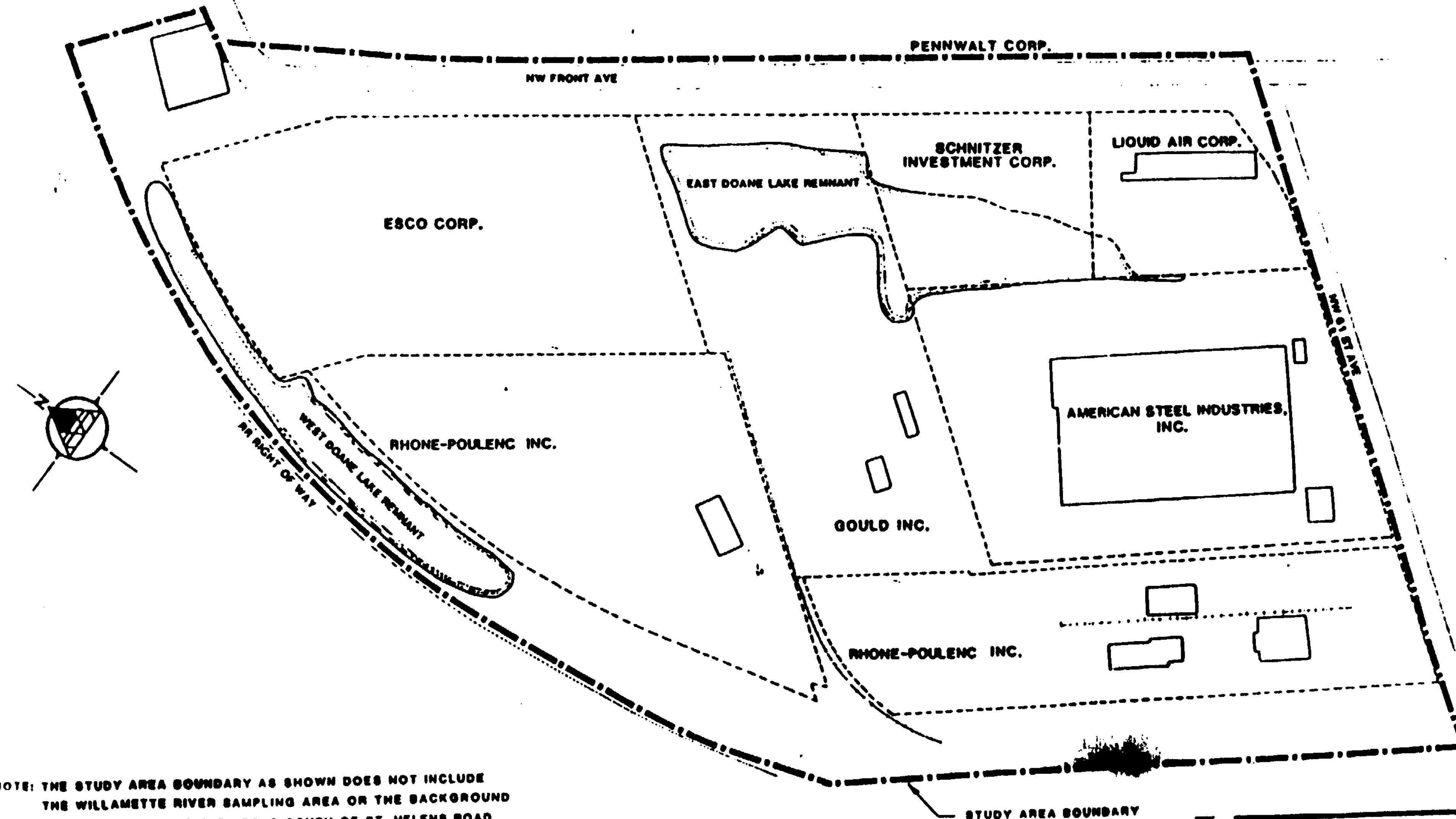


NOTE: THE STUDY AREA BOUNDARY AS SHOWN DOES NOT INCLUDE THE WILLAMETTE RIVER SAMPLING AREA OR THE BACKGROUND SURFACE SOIL SAMPLING AREAS SOUTH OF ST. HELENS ROAD.

Reference:
From a topographic survey map dated May 10, 1980,
by D.E. Mars & Associates, Gresham, Ore.,
for Dames & Moore

Figure 2

Study Area Location Map

Site Features

In general, the Gould site is located in an area which is less densely populated than surrounding areas to the northeast and southeast. The site is located in census tract 43, a large tract which parallels the Willamette River for approximately 7 miles. A few widely scattered private residences and rental units are located in a narrow zone between N.W. St. Helens Road and Forest Park, south and west of the study area. The 1985 census data for all of Census Track 43 shows a total of 425 dwelling units, 380 of which are single family homes. The site is located about 13 miles from the city center of downtown Portland, with a population of over 400,000.

The existing land use in the study area and vicinity is primarily industrial, and generally follows the City of Portland zoning code designations. No significant changes in the area's existing land use patterns are presently planned.

Airflow is usually northwesterly in the Portland area in spring and summer, and southeasterly in fall and winter. The winter season is marked by relatively mild temperatures, cloudy skies and rain with southeasterly surface winds predominating. Summer produces mild temperatures, northwesterly winds and little precipitation. Wind direction at the Gould site is strongly influenced by the topographic features of the hillside southwest of the site. Resulting wind directions tend to be northwest-southeast along the Willamette River. Precipitation in the Portland area is mostly rain. Average rainfall is 37.39 inches. Monthly averages vary from 0.46 inches in July to 6.41 inches in December.

The Gould site is located on the left bank floodplain of the Willamette River, approximately 7 miles upstream from the confluence of the Willamette River and the Columbia River. The floodplain of the Willamette River occupies the lowest portions of the Willamette Valley, which is a broad downwarp between the Cascade and Coast Ranges of northwest Oregon and southwest Washington. In addition to man-made fill, the site is underlain by a few to several tens of feet of alluvial deposits, which in turn overlie the lava flows of the Columbia River Basalt. The site is situated on the northeast flank of the Portland Hills anticline, where the anticline dips beneath the young sediments that fill the Portland Basin. Groundwater flow is generally in a northerly direction.

The Gould site occupies a flat area between the Willamette River on the east and the forested slopes of the Tualatin Mountains to the west. The site is mostly paved with asphalt and is basically devoid of natural vegetation. The vegetation that exists is mostly brush, small trees, and blackberries along the property fenceline.

Occurrence of animals at the site is low, since the habitat necessary to support on-site fauna is limited. Common animal species that have been seen on-site include ground squirrels that are resident on the pond, and bird species that feed in the brushy, weedy areas around the site perimeter. Some cattails grow in East Doane Lake.

It is doubtful that any fish reside in either West or East Doane Lake since natural water sources and discharges are limited. Also, high levels of contamination have resulted in water quality levels that will not support higher aquatic life forms. Some amphibians have been noted in and around the lake. Numerous fish species reside in or migrate through the lower reach of the Willamette River in the vicinity of the site.

II. ENFORCEMENT SUMMARY

On the current Gould site, a secondary lead smelting facility was completed and went into operation in 1949 under the ownership of Morris P. Kirk and Sons (Kirk & Sons), a subsidiary of NL Industries, Inc. Facility operations consisted of lead-acid battery recycling, lead smelting and refining, zinc alloying and casting, cable sweating (removal of lead sheathing from copper cable), and (after 1965) lead oxide production.

Available records for the period between February 1960 and January 1970 indicate that Kirk & Sons received 14 complaints and/or violations regarding emissions from the facility. A January 29, 1970 report by the Columbia-Willamette Air Pollution Authority expressed concern over levels of lead in the vicinity of Morris P. Kirk, and the potential threat to health caused by continued plant operations.

NL Industries, Inc. purchased the property from the subsidiary in 1971. Three violations for excessive emissions were recorded in 1972. Lead was detected in Doane Lake in 1973, and NL Industries was cited for improper wastewater discharge into the lake. On July 30, 1973, NL Industries curtailed all smelting operations, but the lead oxide still, cable sweater, and refining kettles continued to operate. Available records indicate that the facility operated in compliance with DEQ guidelines during 1974 through 1976.

The property was sold by NL Industries to Gould, Inc. in January 1979. In October of the same year, Gould stopped receiving lead-acid batteries, but continued to process a substantial existing stockpile of batteries. In January 1980, lead refining operations were discontinued. Battery breaking operations ceased on April 1, 1981, lead oxide production ceased in May 1981, and the facility closed entirely in August 1981. By the summer of 1982, most of the structures, facilities, and equipment had been removed.

In 1981 EPA and DEQ began investigations of the site. The site was placed on the Superfund National Priorities List in 1983. In 1985 an order on consent was signed with NL and Gould which involved the performance of an RI/FS at the site.

More recently, Special Notice Letters have been sent to NL and Gould under the authority of Section 122 of CERCLA. Information requests under Section 104(e) have also been sent to industries in the vicinity of the site requesting information on hazardous contaminants and contamination at those facilities. The information received from these companies will be used in designing the additional groundwater and surface water studies described in the selected remedy.

A historical sequence of enforcement related events is presented in Table 1.

TABLE 1

ENFORCEMENT HISTORY

July 1966	The Air Quality Control (AQC) Division observed heavy emissions of yellow dust for 10 minutes around the Kirk & Sons facility.
Dec. 1966	The AQC observed the baghouse stack emitting an opacity reading of 2 to 3 on the Ringleman scale.
1967	The AQC and the Portland Regional Air Pollution Authority reported six opacity violations from the smelter.
Dec. 1968	The Columbia-Willamette Air Pollution Authority reported a 30-minute violation from the lead sweat furnace stack.
March 1969	The Columbia-Willamette Air Pollution Authority noted a 15-minute violation from the baghouse exhaust stack.
Nov. 1969	Kirk & Sons corrected baghouse emissions from melting kettle and blast furnace.
Jan. 1970	The Columbia-Willamette Air Pollution Authority calculated lead emissions from the Kirk & Sons facility and concluded: "It is apparent that levels of lead in the vicinity of Morris P. Kirk can cause a definite threat to health and should not be allowed to continue."
March-June 1970	The Columbia-Willamette Air Pollution Authority observed two opacity violations.
1971	NL Industries purchased the property from their subsidiary, Morris P. Kirk & Sons. Also, this same year battery manufactures began using plastic for casings.
March 16, 1972	The Columbia-Willamette Air Pollution Authority observed two opacity violations.
March 1973	The DEQ sampled NL facility discharge into Doane Lake; test results indicated 9.5 and 10.3 ppm lead. NL Industries cited for wastewater discharge to Doane Lake.
April 1973	The Columbia-Willamette Air Pollution Authority requested that NL Industries provide a compliance schedule to control emissions from the blast furnace before issuing a new Air Contaminant Discharge Permit. Monitoring and reporting provisions were also a requirement.
July 1973	NL Industries curtailed all smelting operating and remodeled the Portland facility to function as a transfer point to ship and receive goods from Los Angeles. The lead oxide still, cable sweater, and refining kettles continued to operate.

Oct. 1976	Violations for wastewater discharge by NL Industries were corrected.
Aug. 15, 1978	East Doane Lake sampled by DEQ; test results indicated 0.1 and 0.3 ppm lead.
Jan. 1979	Gould Inc. purchased the facility from NL Industries.
Nov. 8, 1979	Preliminary modeling analysis by DEQ suggested Gould may be violating the new ambient lead standard for the lead trailer loading operation.
March 5, 1981	DEQ issued notice to Gould of discharge violations and creating offensive conditions.
April 1981	DEQ obtained two yard-cleaning samples; EP leachate test results indicated 280 and 4,200 ppm lead.
July 1981	DEQ sent notice to Gould of intent to assess civil penalties.
Aug. 1981	Gould facility ceased all operations.
Oct. 30, 1981	DEQ requested that Gould undertake a comprehensive cleanup program.
July 22, 1982	DEQ decided no cleanup of the Gould site was warranted by the groundwater data received to date.
Sept. 24, 1982	DEQ requested that Gould submit a schedule for removing the battery cases from the site and for sampling soil and pond sediments on the site.
Oct. 26, 1982	Gould responded to DEQ request, indicating that they would level and cover the battery casings.
Dec. 1982	DEQ rejected Gould's plan for covering the battery casings.
Feb. 1983	Gould Inc. submitted a letter to EPA objecting to EPA's Hazard Ranking System (HRS) score for the site (see Appendix D). The score had been used by EPA to propose inclusion of the site on the NPL. In particular, the Gould letter objected to the methods used to determine airborne contaminant hazards at the site.
Aug. 1[illegible]	Gould Inc. and NL Industries signed Section 106, Administration Order on Consent for the Remedial Investigation/ Feasibility Study (RI/FS) of the facility.
April 1986	Work Plan for RI/FS by Dames & Moore was approved and site investigations began.
Nov. 1987	Final RI report submitted to EPA and DEQ.
Feb., 1988	Final FS report submitted to EPA and DEQ.

III. COMMUNITY RELATIONS SUMMARY

In 1983, Oregon congressional representative Les AuCoin corresponded with DEQ about the site, and DEQ held a meeting with city, county, and state agency officials to present information about environmental concerns in the area and to solicit comments. Representative AuCoin specifically requested that DEQ assure him that site cleanup would completely remove potential contaminants.

A Community Relations plan was prepared for this site in 1985 based on research and interviews with interested community members and officials. The Community Relations Plan identified several issues of concern to the affected community and local officials, including:

1. Groundwater Pollution. People were concerned about ground- water contamination in the area and how it might affect future growth of the area.

   EPA responsed to this concern by including extensive groundwater testing in the RI.

2. Airborne Lead. Several agency officials indicated that high levels of lead emissions were a primary concern and that high levels of airborne lead could adversely affect the health of nearby workers. Exposure to lead at the approximately 10 houses in the hills above the site was thought unlikely, but necessary to investigate.

   EPA has included air monitoring in the RI.

3. Effects on Workers' Health. Individuals were concerned about exposure through incidental ingestion of ground water obtained for industrial use and exposure to airborne lead.

   EPA has included exposure scenarios for workers in the risk assessment for the site.

4. Cleanup Schedule. Staff from Representative AuCoin's office and a representative from the Oregon State Public Interest Research Group expressed dissatisfaction that cleanup measures had not been implemented earlier.

   EPA has attempted to evaluate the site and make a remedial decision in an expeditious manner. By focusing on the soils unit, a decision will be made now.

5. Future Development of the Doane Lake Area. The media and local officials expressed concern about how the current pollution would affect or restrict future uses of the land.

   Future use restrictions are expected to be minimized by removing or treating as much of the lead at the site as possible.

6. Disposal of Dredged Materials from the River. A representative from the Port of Portland indicated the Port's concern about disposing of dredged materials from the Willamette River that might be found to contain contaminants from the site.

The RI included an evaluation of sediment around the outfall from East Doane Lake.

7. Environmental Investigation of Doane Lake Area. A representative from the Association of Oregon Industries and representatives of elected officials indicated concern that DEQ's environmental investigation in the Doane Lake area could decrease future industrial development and jobs in the community.

   No reports of decreased industrial development as a result of these investigations has been received by EPA.

8. Disposal of Battery Casings. An aide to Representative AuCoin's office expressed dissatisfaction that battery casings had not been removed from the site. Representatives from the Portland Department of Public Works cautioned that any plan to dispose of waste materials at St. John's'Landfill would be unpopular.

   EPA intends to recycle as much of the battery casing components as is feasible.

Throughout the course of the RI/FS, additional updates were provided to the public during the investigation and reporting phases. A proposed plan and notice of public hearing was published in the Oregonian on February 8, 1988. The public comment period for the site was from February 8 through March 18. Two public meetings were held to discuss the results of these studies and EPA's proposed plan: the first on February 18, 1988 and the second on March 10, 1988. At both meetings, there was clear community support for thorough cleanup of the site and contaminated groundwater. The results of these meetings will be discussed further in the Responsiveness Summary (Appendix B).

IV. NATURE AND EXTENT OF PROBLEM

__Contaminants Evaluated__

During the scoping of the RI/FS, the emphasis at this site was on metals contamination from the battery recycling operations. Of primary importance was the presence of lead in each of the media. Although groundwater in this area also has organic chemical contamination, that contamination was not evaluated in these studies. As part of the selected remed[illegible]itional work is proposed for the groundwater which will take into [illegible] organic chemical contamination. The purpose of this addit[illegible]work will be to determine what, if any, remediation actions are requi[illegible] the surface water and groundwater at the site.

Contaminated media at the Gould site that were investigated include battery casings, matte, surface soils, subsurface soils, lake sediments, surface water, and groundwater.

Extent of Contamination

Battery Casings and Matte. The lead smelter on the Gould property operated between 1949 and 1973. During this period, a daily production of approximately 35 to 40 tons of lead has been reported. An average of 1,500 batteries were processed daily. As a result of these production records and the RI investigation, a total of 86,900 tons of battery casings and 6,570,000 gallons of acid were estimated to be disposed of at the site.

In addition to acid and battery casings, a third waste product called matte was produced by the smelting operation. Matte disposal is estimated at 11,800 tons. This material was reportedly used as fill only on the Gould site, just to the northeast of the facility.

Much of the battery casing fragments produced during this period (1949-1973) were disposed off site on the Rhone-Poulenc property. The quantity of battery casing materials disposed was calculated using test pits and a fill thickness contour map. Table 2 summarizes the locations and estimated quantities of battery casings. Figure 3 shows the locations of the battery casings and matte within the study area.

TABLE 2

BATTERY CASINGS QUANTITIES AND LOCATIONS

Gould Property	(1949-1973)	41,300 cu yds	44,500 tons
	(post-1973)	11,100 cu yds	12,000 tons
	Surface Piles	1,700 cu yds	1,600 tons
Rhone-Poulenc Property		26,700 cu yds	28,200 tons
	Totals	80,800 cu yds	86,900 tons

The batteries consist of hard rubber, ebonite, plastic casings, metallic lead, and lead oxides. Lead concentrations (mostly lead oxide) ranged from 7,600 mg/kg (0.76 percent) to 190,000 mg/kg (19 percent). All of the battery casing samples had EP Toxicity results for lead above the regulatory limit (EP Toxicity limit = 5.0 mg/l). These values ranged from 21 mg/l to 220 mg/l. There was no apparent correlation between total lead concentration and EP Toxicity leachate lead concentration. The EP Toxicity results for arsenic, chromium, and cadmium were below detection limits.

About 2% of the total volume of battery casings is located in surface piles on the Gould property, the remaining 98% is part of the fill on the Gould and Rhone-Poulenc properties. These subsurface casings are in direct contact with groundwater underneath the site. The characteristics of the surface piles of casings differ from the subsurface piles. The surface piles contain a higher percentage of plastic and metallic lead relative to subsurface casings on the Gould property or from the Rhone-Poulenc property, which contain a higher percentage of rock and slag. The metallic lead, plastic, ebonite and lead oxide components of these casings are potentially recyclable. The estimated fractions of the various components in the surface and subsurface casings are shown in Table 3.

TABLE 3

ESTIMATED BATTERY COMPONENT QUANTITIES

Rhone-Poulenc & Gould Subsurface	In-Situ Density lbs/cu. ft.	In-Situ Volume cu. yds.	Tons	Per Cent (weight)
Ebonite	68.00	69,008	63,349	74.3
Plastic	46.56	4,070	2,558	3.0
Metallic Lead	297.46	117	469	0.6
Lead Oxide/Mud	238.37	2,703	8,700	10.2
Rock/Slag	105.56	1,938	2,762	3.2
Other	74.28	1,264	1,268	1.5
Moisture	62.30	0	6,113	7.2
Subtotal	79.80	79,100	85,218	
Gould Surface				
Ebonite	65.81	899	799	50.0
Plastic	45.06	595	362	22.5
Metallic Lead	287.88	6	24	1.5
Lead Oxide/Mud	230.69	52	161	10.0
Rock/Slag	102.16	148	204	12.7
Other	71.89	0	0	.0
Moisture	62.30	0	59	3.7
Subtotal	70.07	1,700	1,609	
Total	79.60	80,800	86,827	

The matte materials consist of metallic sulfide chunks primarily containing iron and lead. Lead concentrations in the matte samples ranged from 6.4 percent to 11 percent. All of the samples had EP Toxicity results for lead above the regulatory limit of 5.0 mg/l. Low concentrations of arsenic and cadmium were detected in the EP Toxicity leachates. These concentrations were within the regulatory limits (5.0 mg/l and 1.0 mg/l, respectively).

Surface Soils, Subsurface Soils, and Sediments

In addition to battery casings and matte, large quantities of soil at the site are contaminated with lead and can serve as secondary sources for lead t[illegible]rt. The quantities of surface soil, subsurface soil, and sedi[illegible]sidered to be secondary sources were estimated by using total lead a[illegible] Toxicity data.

F[illegible] shows the areas of surface soil that were identified as secondary source areas using the above total lead criteria. The quantity of surface soil on the Gould property considered a secondary source is approximately 2,400 cu yds. The quantity on the Rhone-Poulenc property is approximately 970 cu yds. These quantities are based on a 3,000 ppm lead level in soils. Criteria for surface soils in the selected remedy are based on a lower lead level and as a result actual volumes determined in design may be higher than these estimates.

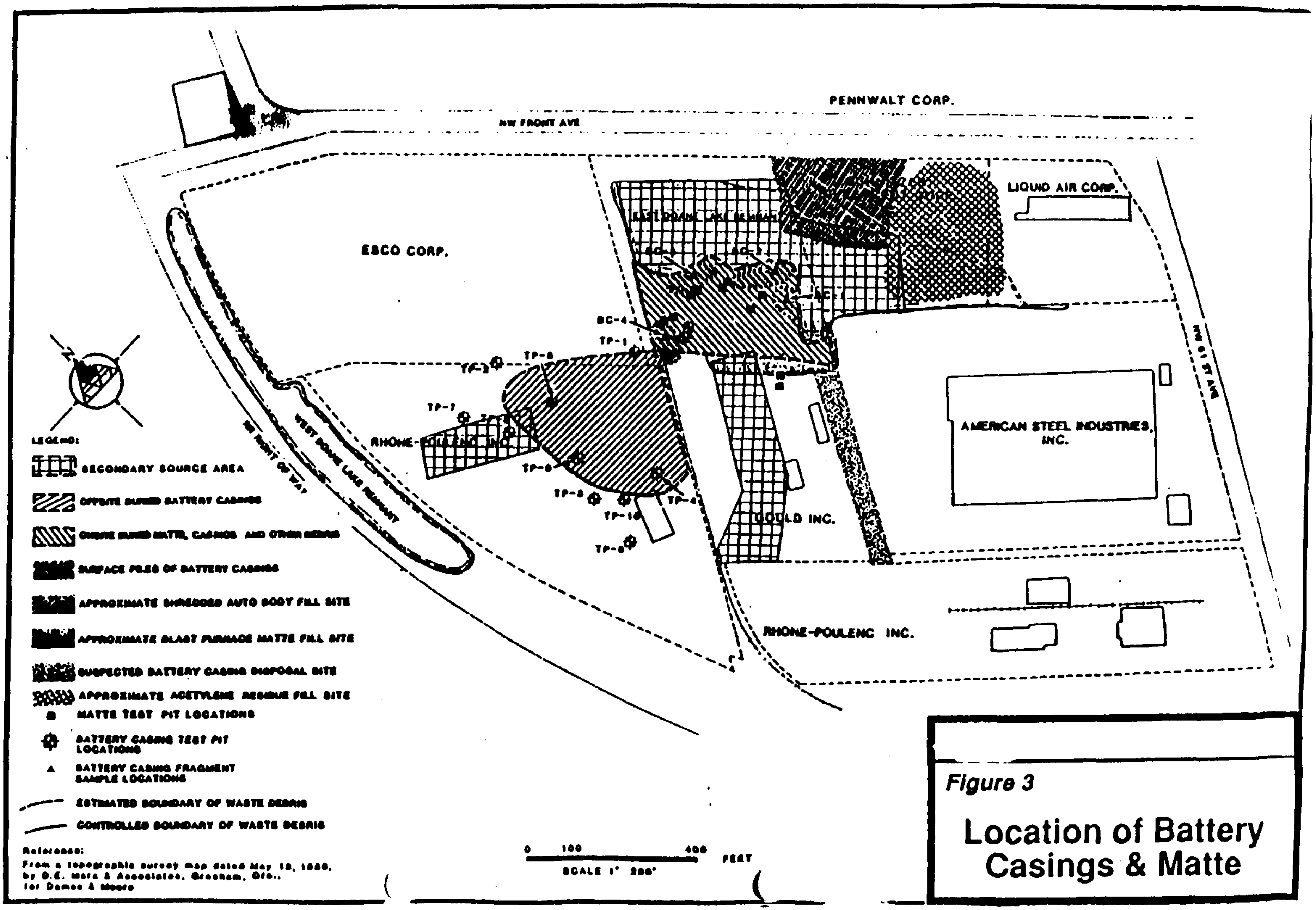


Figure 3

Location of Battery Casings & Matte

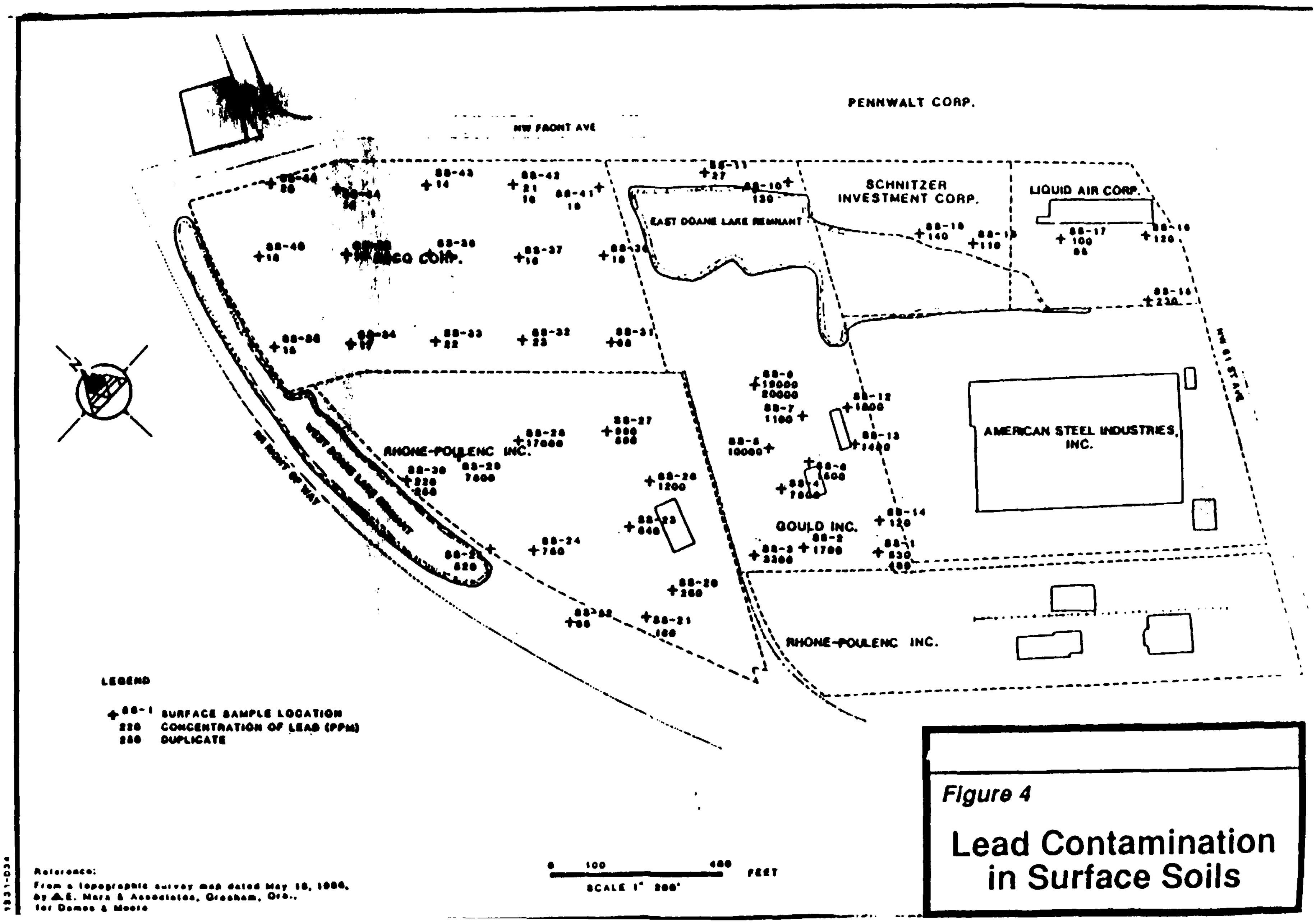


Figure 4

Lead Contamination in Surface Soils

The volumes of subsurface soils estimated to be secondary sources are as follows:

1. One foot of soil below the entire area of the battery casing/matte excavations. This would amount to 4,300 cu yds from the area on Rhone-Poulenc property and 5,000 cu yds from the area on the Gould property; and,

2. One foot of soil from the sides of the excavations. Assuming average excavation depths of 20-feet on the Rhone-Poulenc property and 25-feet on the Gould property, and an excavation side-slope ratio of 2:1, this would amount to approximately 2,170 cu yds from the Rhone-Poulenc property and 2,180 cu yds from the Gould property.

Sediment samples collected from East Doane Lake contained total lead concentrations ranging from 160 mg/kg (parts per million) to 12,000 mg/kg. The estimated quantity of secondary source material in East Doane Lake is 5,500 cubic yards. West Doane Lake sediments are not considered secondary sources.

Sediments collected in the Willamette River during August 1986 and February 1987 had generally low metals concentrations. Total lead concentrations ranged from 26 to 56 mg/kg. Other metals concentrations included total arsenic at 5.7 to 6.2 mg/kg, total chromium at 9 to 26 mg/kg, and total zinc at 72 to 82 mg/kg. Cadmium and hexavalent chromium concentrations were near or below the detection limits. Like the West Doane Lake sediments, Willamette River sediments are not considered secondary sources. The total quantity of soil considered secondary source material is summarized in Table 4.

TABLE 4

ESTIMATED SECONDARY SOURCE VOLUMES

TYPE AND LOCATION		QUANTITY (cu yds)		
Surface Soil				
Gould property			2,400	
Rhone-Poulenc property			970	
Surface Soil Total			3,370	3,370
Subsurface Soil				
Gould property		5,000		
Bottom Sides		2,180		
Sub-total		7,180		
Rhone-Poulenc property		4,300		
Bottom Sides		2,170		
Sub-total		6,470		
Subsurface Soil Total		13,650		13,650
Sediment				
East Doane Lake	5,500	5,500		
Secondary Source Total				22,520

Surface Water. Surface water in the study area consists of two remnants of Doane Lake. The two remnants are referred to as East Doane Lake and West Doane Lake (see Figure 2).

Direct precipitation and precipitation runoff from surrounding properties are the only sources of surface water to the lake remnants. Groundwater recharge also contributes water to the remnants. Their surface elevation rises and falls seasonally with rainfall and presumable groundwater recharge. However, there is no simple relationship apparent between precipitation and lake level.

East Doane Lake discharges via a drain pipe to the north beneath N.W. Front Street; the discharge enters the Willamette River approximately 200 feet east of the railroad bridge. There is no known surface discharge from the West Doane Lake remnant.

Surface water in East Doane Lake exceeds the lead drinking water standard of 0.05 mg/l. Surface water concentrations were as high as 0.28 mg/l. Levels in West Doane Lake were below the standard.

Ground Water. The site hydrostratigraphy includes unconsolidated fill and alluvial deposits overlying basalt flows. The fill consists largely of sands and gravels, silts, and an abundance of slag, bricks, metal parts, and battery casings. The alluvial deposits consist predominantlY of clays, silts and sands with the silt content generally increasing with depth. The basalt flow beneath the fill and alluvial deposits is thought to be fractured and weathered. Ground water occurs in the fractured and weathered portions of the basalts.

The fill and alluvial deposits form an interconnected, heterogeneous, and anisotropic aquifer. The fill and alluvial water-bearing zones are believed to be generally unconfined; however, due to the layering, heterogeneity, and anisotropy there may be locally confined conditions within the aquifers.

Four water-bearing units are identified beneath the site. These units are the fill, the upper alluvial, the lower alluvial, and the basalt water-bearing units. In the upper aquifers there is a significant component of downward flow, although flow at the basalt-alluvial interface appears to be from the basalt to the alluvial aquifer.

Groundwater Contaminant Delineation. Figures 5,6 and 7 show the extent of lead contamination in the fill and alluvial aquifers. The contours show where dissolved lead concentrations exceed the MCL of 0.05 mg/l as well as the MCLG of 0.02 mg/l. The sulfate plume that has resulted from disposal of battery acid is also shown.

The relationship between dissolved metals, sulfate concentrations and pH is similar in both the fill and alluvial aquifers. Both show elevated dissolved metals and sulfate levels in association with lower pH values.

In the upper alluvium, the lead plume has migrated at least as far north as well 10D, shown in Figure 6. Increased dissolved metal concentrations appear to be the result of the lower pH which increases the solubility of metals, thus carrying high levels of lead as the "plume" migrates. Total lead migration from the site is estimated to be from 0.3 to 0.6 lb/yr.

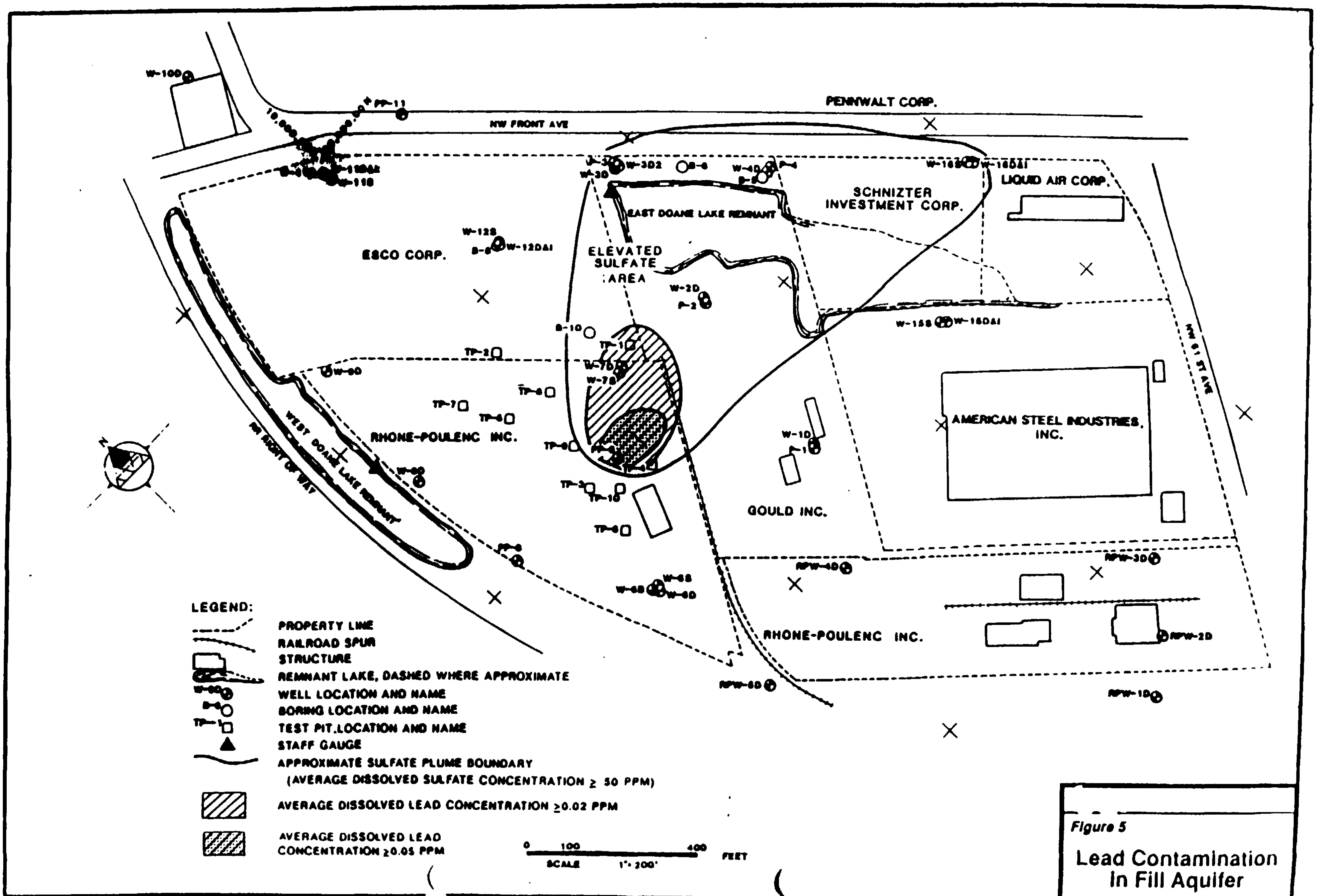


Figure 5

Lead Contamination In Fill Aquifer

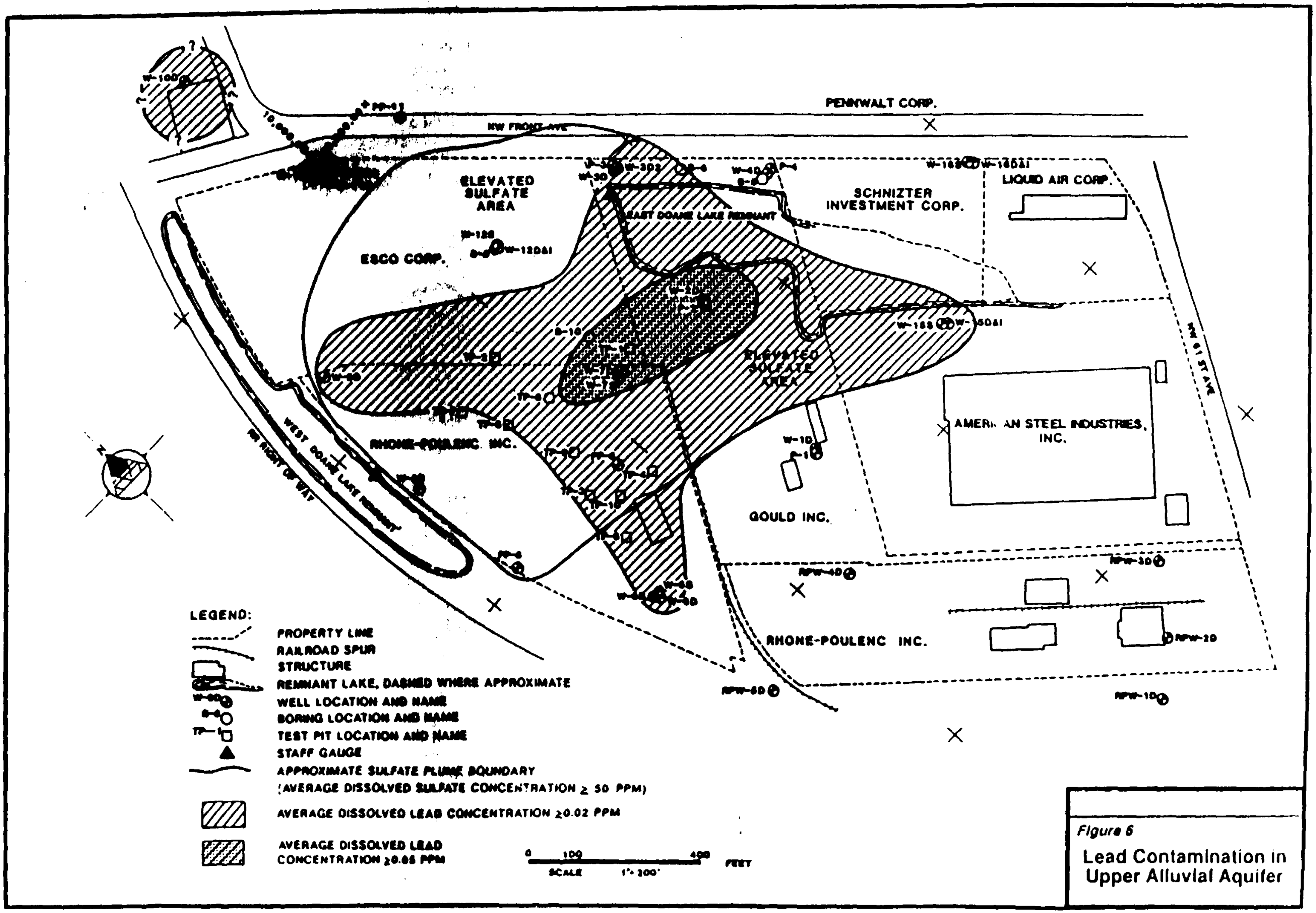


Figure 6

Lead Contamination in Upper Alluvial Aquifer

11831-034

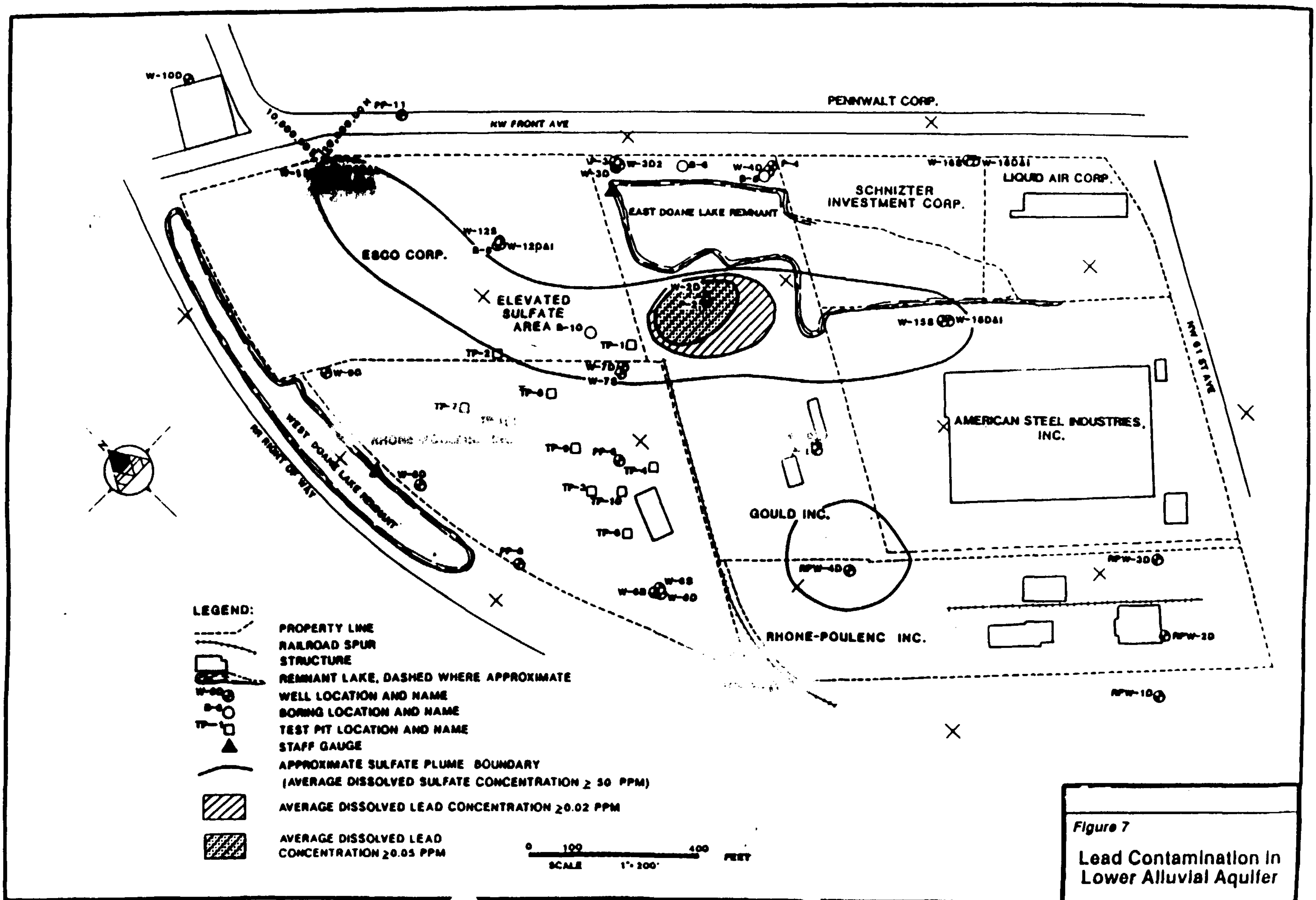


Figure 7

Lead Contamination In Lower Alluvial Aquifer

Treatability Studies on Casings and Contaminated Soils

As part of the Feasibility Study, several engineering studies were performed to determine whether the SARA preference for treatment could be met. A bench-scale soil stabilization study was performed by Weston Services, Inc. Weston used several different reagents to determine the applicability of the soil stabilization technique to site soils and lake sediments. The results showed that admixtures of Portland cement, cement kiln dust, and lime kiln dust with the soil and sediment at specific increments improved the consistency and structural stability of the soils and sediments, and also reduced the leachability of the contaminated materials to levels generally below hazardous waste designation levels.

Three battery casing separation tests were performed on site materials. One test was performed on equipment manufactured by MA Industries, Inc. and the other two on equipment manufactured by Poly-Cycle Industries, Inc. To conduct each test, representative material was excavated from the site and shipped to locations where equipment manufactured by the two companies is in use. In the case of MA Industries, the test was run on equipment operated by Ace Battery Company of Indianapolis, Indiana. The tests of Poly-Cycle equipment were run at the Poly-Cycle plant in Jacksonville, Texas. The studies show that much of the battery casing material is potentially recyclable, however, additional design work will be required to modify the pilot facilities used in the treatability studies to actual conditions at the site. Reasonable physical separation of the plastic and ebonite components with some equipment modifications appears to be possible, although the degree of metallic lead contamination of ebonite may be high even after separation; additional design work will be required to modify the process to treat the ebonite stream in order for it to pass the EP Toxicity test.

During the evaluation of alternatives, similar tests were run independently by researchers working on materials from the United Scrap Lead Superfund site near Troy, Ohio. Researchers there performed bench-scale tests using various solutions and mechanical cleaning steps to determine the amenability of lead to be removed from the ebonite material. The results of this test are generally favorable indicating that the ebonite stream can be cleaned. However, the researchers have concluded that more work is required before the bench-scale results could be applied to any field-scale unit. This is a typical requirement for any bench scale testing.

Contaminant Transport and Need for Additional Study

Two types of lead sources exist at the Gould site. The major source includes debris remaining from earlier lead recovery operations, including battery casings and parts and the smelter matte. Secondary sources which may be significant include surface, sediment, and subsurface soils near the industrial sources. These materials may act as a source for lead in ground water, surface water or air after the primary (industrial) sources have been removed or stabilized.

Groundwater Transport. The most important chemical change encountered in the groundwater system on (and near) the site is pH change. At the primary sources, the pH is generally quite low (pH <5) because of the sulfuric acid from the scrapped batteries. As pH increases, the solubility of lead in water decreases, accompanied by the precipitation of lead oxides and hydroxides.

The amount of lead that can be dissolved in ground water is a function of temperature, pH, other dissolved species present, amount of available lead and contact time. Assuming temperatures to be constant, all these factors are significant with regard to lead solubility in ground water in the study area. Based on these factors, an estimated migration rate of 0.3 to 0.6 lb/yr was derived during the RI.

Airborne Transport. The potential for airborne contamination comes from the surface piles of casings and contaminated surface soils at the facility. During the RI, the highest daily ambient lead values observed were 5.20 ug/m^3. This is above the NAAQS of 1.5 ug/m^3. The highest monthly average airborne lead concentrations observed were 1.56 ug/m^3 and 0.94 ug/m^3. The highest quarterly average airborne lead concentration was 0.56 ug/m^3. These results indicate that dry weather and disturbance of site materials may cause airborne transport of lead containing materials.

Need for Additional Study The exact nature of lead migration has not yet been well characterized. For that reason, additional investigations of the groundwater and surface water unit at this site are recommended in the selected remedy. The proposed additional work will involve expanding the area for groundwater and surface water monitoring and including organic chemical contamination in the evaluation of groundwater quality.

Endangerment Assessment

Human Health Effects. An endangerment assessment was performed to evaluate the potential for human health and environmental exposure risks associated with the no-action alternative as well as the remedial action alternatives. The primary contaminants included in the assessment are lead, along with arsenic cadmium, chromium and zinc. Arsenic is treated as a carcinogen for both inhalation and ingestion routes, while cadmium is treated as a carcinogen for only the inhalation route. As part of the endangerment assessment, a screening analysis for these other contaminants was performed based on the values found at the site and the relative toxicity of these compounds compared to lead. As a result of this screening, risks from lead exposure were found to dominate risks from exposure to the other chemicals. Lead was selected as the indicator compound for assessing risk and evaluating the various remedial alternatives.

Three potential critical pathways were identified, including airborne exposure from on-site fugitive dust sources, incidental oral ingestion of contaminants, and dermal contact as well as incidental ingestion of lead from surface water in East Doane Lake. No exposure from drinking water was included. Groundwater contamination will be evaluated further in the additional work proposed under the selected remedy.

Inorganic lead may be absorbed by inhalation or by ingestion. Absorption by either route contributes in an additive fashion to the total body burden. Among adults, inhalation is the more efficient of the two mechanisms. The fraction of inhaled lead absorbed from the respiratory tract is approximately 40 percent, while the fraction of ingested lead absorbed from the gastrointestinal tract is approximately 10 percent. These rates may be higher in children and are of particular relevance in assessing exposures in this sensitive subpopulation.

Lead is highly persistent in the environment and is bioaccumulative. When lead is first absorbed, it enters the bloodstream and is dispersed unevenly in the body among blood, soft tissue, and bone. Approximately 90 percent of the lead in blood is bound to the red blood cells. The overall half-life of lead in blood has been calculated to be 36 $\pm$ 5 days. Lead is excreted from the blood into the urine. Lead in soft tissue has a calculated mean half-life slightly less than that in the blood and is excreted by alimentary tract secretions, hair, sweat, and nails. Most lead absorbed into the human body is deposited in the bone. Lead in the bone is calculated to have a half-life of approximately 10,000 days (27 years).

The toxicology of lead has been extensively reviewed. Alterations in the hematopoetic (blood forming) and central nervous systems are the primary toxic effects caused by exposures to lead. Cognitive and behavioral deficits are the focus of much current research on relatively low levels of lead exposure.

The Centers for Disease Control (CDC) has determined that a blood lead level in children of 25 ug/dl or above indicates excessive lead absorption and constitutes grounds for medical intervention. That determination is based on the occurrence of enzymatic abnormalities in the red blood cells at blood lead levels above 25 ug/dl and by the finding of neurologic dysfunction in children at blood lead levels between 35 and 50 ug/dl. Further, the CDC defines childhood lead poisoning at a blood lead level of 25 ug/dl in association with an erythrocyte protoporphyrin (EP) level of 35 ug/dl or above (CDC 1985). In its draft toxicological profile for lead, CDC has also cautioned that concentrations greater than 500-1000 ppm could lead to elevated blood lead levels in children inhaling or swallowing dirt. Recent findings of cognitive deficits associated with lower blood lead concentrations may result in a review of the adequacy of the existing CDC threshold level. EPA has issued a revised maximum contaminant level goal (MCLG) of 20 ug/liter lead. The current MCL of 50 ug/liter is used to derive an acceptable intake chronic (AIC) risk criterion for ingestion of lead.

Based on discussions with EPA and following the noncarcinogenic risk evaluation procedures of the <u>Superfund Public Health Evaluation Manual</u>, Acceptable Intake: Chronic (AIC) values were used to assess the significance for human health of potential inhalation and ingestion exposures to lead calculated for the Gould Inc. site. AIC criteria are designed to represent an intake for a contaminant that would be acceptable on a long-term continuing basis without producing adverse health effects. Separate AIC values for inhalation and ingestion exposures are derived by EPA from the National Ambient Air Quality Standard (NAAQS) for lead (1.5 ug/m^3 quarterly) and the drinking water standard for lead (0.05 mg/l), respectively. Each AIC is calculated as the environmental criterion concentration times contact rate divided by adult body weight. Assuming 20 m^3/day of air breathed, 2 liters/day of water ingested, and an adult body weight (bw) of 70 kg, the derived AIC values are 0.0004 mg/kg-bw/day for inhalation and 0.0014 mg/kg-bw/day for ingestion. For each calculated exposure dose (in mg/kg-bw/day) in this endangerment assessment, risk is represented by a hazard index (HI) number equal to the calculated dose divided by the appropriate AIC value. Thus, a hazard index greater than 1.00 represents a calculated dose greater than the AIC criterion value, given the exposure model assumptions and the environmental concentrations used in the model.

Figure 8 provides a visual summary of the results of the exposure calculations for the No-Action Alternative. Inhalation and ingestion exposures for each scenarios are scaled appropriately in comparison to AIC values. As Figure 8 shows, the high dose cases for ingestion of soils indicate extremely high intakes of lead. These intakes result from calculations assuming contact with the lead oxide--almost pure lead--in the battery casing waste piles. Even if more realistic assumptions than continuous daily contact with the waste piles are made, the results of any contact with and ingestion of contaminants from the battery casing piles would be significant in comparison to either baseline exposures or ingestion AIC values. The high dose ingestion calculations are not considered to be a basis for evaluation of potential health impacts from the site (they are excessively conservative); however, they clearly demonstrate the potential significance of any contact with the existing source materials on site.

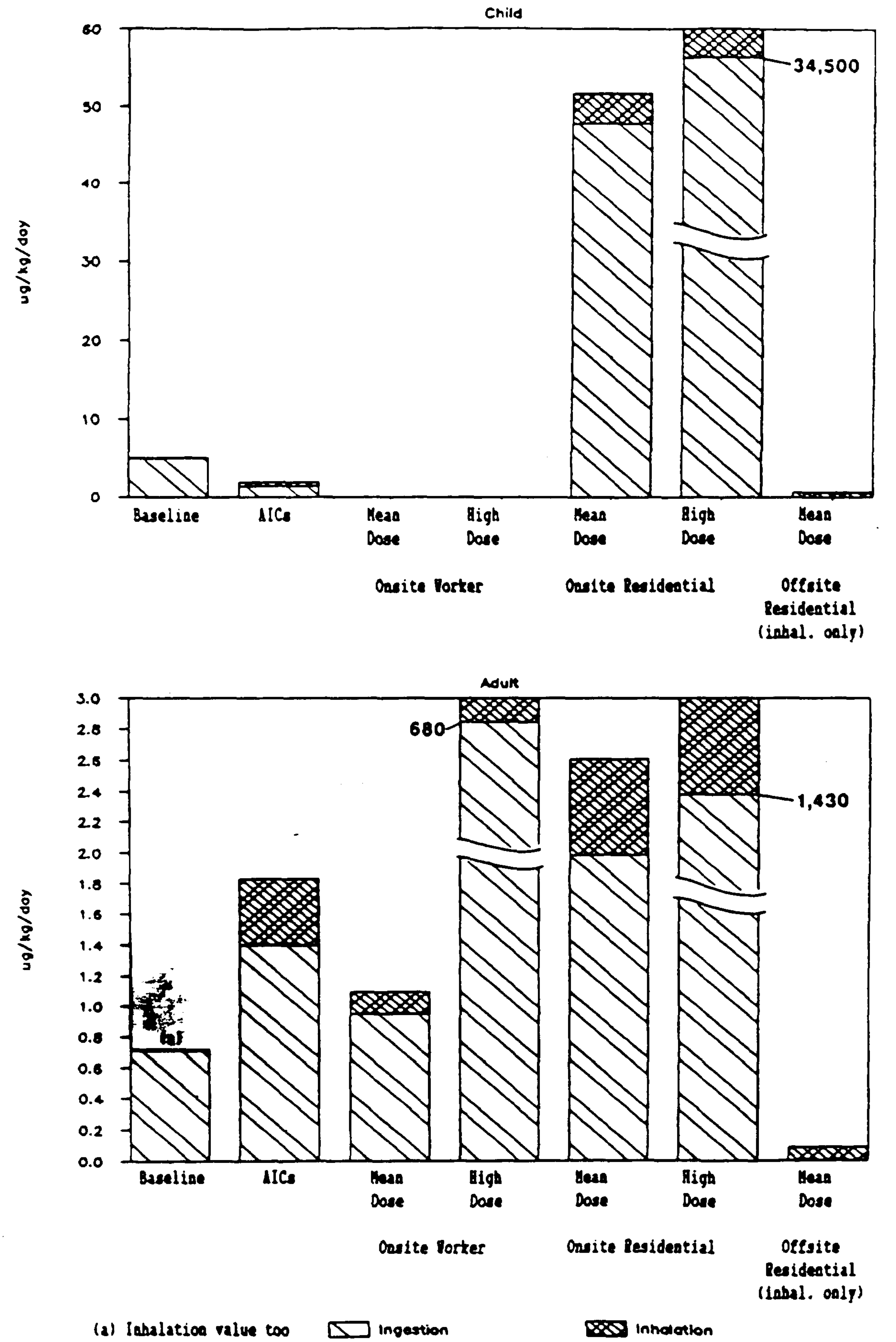
For on-site workers (adults only), total lead intake increases to about 2.5 times baseline intake, with inhalation exposures increasing by a greater percentage than ingestion exposures but still accounting for less than 10 percent of total exposures. Both inhalation and ingestion mean dose exposures are lower than AICs. Off-site residential total lead intake increases only marginally for adults or children (about 14 percent). Only inhalation exposures are included in this scenario, with the ambient air lead concentration assumed to be constant at 0.33 ug/m^3, or 22 percent of the NAAQS value of 1.5 ug/m^3. In the on-site residential base case scenario, adult lead intake increases almost fivefold and children's lead intakes by a factor of more than 11. Both inhalation and ingestion exposures are substantially increased in all age intervals; all hazard indices for children and adults are greater than 1.00, with a maximum of 11.2 for inhalation and 34.2 for ingestion among children's age intervals.

Environmental effects. It is doubtful that any fish reside in either East or West Doane Lake. During field sampling activities, numerous aquatic insects and frogs were observed in the West Doane Lake. None were observed during concurrent sampling in the East Doane Lake, although mallards are reported to be resident there. Numerous fish species reside in or migrate through the lower reach of the Willamette River in the vicinity of the site. These include migrant Chinook and Coho salmon, and Steelhead and American shad. Resident species include largemouth and smallmouth bass, crappie, bluegill, walleye, northern squawfish, catfish, mountain whitefish, carp, sucker, peamouth, and chiselmouth (Oregon Department of Fish & Wildlife 1972, 1986).

The Willamette River in the site reach flows through a highly industrialized area that receives a variety of point- and non-point source pollutants. Dissolved lead values upstream of the area of the discharges from the Gould site have exceeded the chronic aquatic life standard of 1.3 ug/l in some 45 percent of the samples from the past decade (USGS 1975 - 1984 data). Total recoverable lead values have been still higher. Levels of lead have trended downward with no values greater than 2 ug/l in the last three years of this period.

Figure 8
Summary of Exposure Calculations

NO ACTION ALTERNATIVE
INCREMENTAL AVERAGE DAILY DOSE
BY EXPOSURE SCENARIO
(in ug/kg/day)



(a) Inhalation value too small to be visible.

Estimates of the quantity of surface water overflow from the East Doane remnant indicate a maximum value of 7,800,000 gallons per year. Using a range of discharge values, dilution calculations were made to estimate the distance downstream of the outfall at which the concentration in a plume within the Willamette River will reach background levels. Using the above estimates, the plume where lead values measurably exceed background could be several thousand feet long and up to 100 feet wide.

Few recent data are available on fish populations in the vicinity of the Gould discharges; however it is likely that these populations reflect the stresses of the existing habitat. Of primary economic and recreational concern are effects on anadromous (migratory) salmonids. Both juveniles and adults migrate past the site on their way to and from upstream spawning areas. Because of the shallowness of the beach adjacent to the discharges, adults would not be expected to move through concentrated areas of the plume and should suffer little impact from their limited exposures. Thus, it is likely that a significant percentage of outmigrating juvenile salmonids will pass through the plume. Expected residency in the plume would be on the order of minutes if actively migrating or hours if passively drifting down current. Exposures of this duration may cause some minor stress to respiration and metabolism but would not be expected to result in significant numbers of deaths unless a fish were somehow trapped for an extended period in a region with very high concentrations. The EPA criterion for short-term exposure (1 hour) is 0.034 mg/l.

V. ALTERNATIVES EVALUATION

Summary of Alternatives and Evaluation Criteria

This section summarizes the detailed evaluation of the final candidate remedial action alternatives. First, alternatives are subject to a screening for compliance with the protectiveness and ARAR criteria. An additional screening of cost effectiveness is then done to ensure the the selected remedy is a cost effective one. Those that pass the screening are then evaluated against all nine criteria and an alternative is selected that best addresses the combination of criteria. This alternative is considered to represent treatment to the maximum extent practicable.

The Final Candidate Alternatives, identified briefly, are:

Alternative 1 - No-Action Alternative (presented to provide a baseline for evaluating the other alternatives).

Alternative 2A - Removal and Disposal of Surface Piles of Battery Casings; Lime Application to Contaminated Soils.

Alternative 2B - Removal and Disposal of Surface Piles of Battery Casings; Capping of Contaminated Surface Soils; Regrading of the Site and Isolation of East Doane Lake.

Alternative 2C - Excavation and Separation of Surface Piles of Battery Casings, and Subsequent Off-Site Management of Casings; Lime Treatment; Capping of Contaminated Surface Soils; Treatment of Surface Water; and Regrading and Revegetation of the Site.

Alternative 8A - Removal and Disposal of Surface Piles of Battery Casings and Sediments of East Doane Lake; Capping of Contaminated Surface Soils; Treatment of Surface Water; and Regrading and Revegetation of the Site.

Alternative 8B - Excavation and Separation of Surface Piles of Battery Casing Components, and Subsequent Off-Site Management of Casings; Capping of Contaminated Surface Soils; Treatment of Surface Water; and Regrading and Revegetation of the Site.

Alternative 10A - Excavation and Separation of all Battery Casings, and Subsequent Recycle of Some Casing Components; On-Site Incineration of Non-recyclable Components; Fixation or Stabilization of Surface Soils, Subsurface Soils, Sediments, and Matte; Treatment of Surface Water.

Alternative 10B - Excavation and Separation of all Battery Casings, and Subsequent Recycle of Some Casing Components; Incineration of Non-recyclable Battery Casing Components; Lime Treatment and On-Site Placement of Sediments; Treatment of Surface Water.

Alternative 10C - Excavation and Separation of all Battery Casings, and Subsequent Recycle of Some Casing Components; Off-Site Disposal of Non-recyclable Components that Fail EP Toxicity; Fixation or Stabilization of Surface Soils, Subsurface Soils, Sediments, and Matte; Additional Study of Groundwater and Surfacewater Quality.

Alternative 21 - Excavation of Battery Casing Components and Permanent Disposal in an On-Site RCRA Landfill; Fixation or Stabilization of Surface Soils, Subsurface Soils, Sediments, and Matte; Treatment of Surface Water.

Alternative 25 - Permanent Disposal in an On-Site RCRA Landfill of all Site Contaminated Materials, including Battery Casing Components, Surface Soils, Subsurface Soils, Sediments, and Matte; Treatment of Surface Water.

Evaluation Criteria

Nine factors will be considered in evaluating the Final Candidate Alternatives:

- Long-term effectiveness and permanence;
- Reduction in toxicity, mobility or volume;
- Short-term effectiveness;
- Implementability;
- Cost;
- Overall protection of human health and the environment;
- Compliance with applicable or relevant and appropriate requirements (ARARs) that are shown in Appendix A;
- State acceptance; and
- Community acceptance.

The process begins by applying the protectiveness and ARAR factors to each of the candidate alternatives. Alternatives that do not satisfy these requirements will be screened out. Then a cost effectiveness screening is done to ensure that each of the alternatives would be a cost effective solution to the problems at the site. Finally, for the remaining alternatives which have passed these screening steps, all of the factors are weighed in determining the best overall solution to be applied at this site.

Screening of Alternatives

Alternatives 1, 2A, 2B, 8A, and 8B

These alternatives fail the protectiveness and ARAR screens for the following reasons:

- The alternatives rely heavily on institutional controls and monitoring for the protection of public health and the environment.
- Uncontrolled wastes would be left in place on site.
- Extensive continued migration of site contaminants into the groundwater aquifers will occur.
- The alternatives fail to meet ARARs.

Alternative 2C

Although Alternative 2C has many of the same disadvantages of the above alternatives, it involves some treatment of the remaining contaminated material at the site and is therefore considered more protective than the above alternatives. The alternative fails the EP Tox ARAR, and a waiver in this instance would be required. Since alternative 2C is the preferred alternative in the FS report submitted by NL and Gould, it will be carried through the evaluation process.

Alternatives 10A & 10B

These two alternatives pass the protectiveness and ARARs screens. However, the alternatives each involve incineration of the ebonite casings. Due to expected opposition from the community and the State of Oregon, these two remedies are also being screened out at this point.

Alternative 10C

This alternative passes the protectiveness/ARAR screening and will be evaluated in more detail.

Alternatives 21 & 25

These alternatives pass the protectiveness/ARAR screening. They are in fact quite similar alternatives, with the one difference being that in Alternative 21 the soils and sediment are treated before being placed in the RCRA landfill. Since alternative 21 appears to go further in satisfying the preference in the law for treatment to the maximum extent practicable, and since it is later shown to be cost effective, only 21 will be evaluated in detail.

Screening for Cost Effectiveness

The alternatives which pass the initial screening screen are 2C, 10C, and 21. These are then evaluated to determine if any one fails to provide for a solution that is cost effective. The evaluation for these is shown in Table 5.

TABLE 5
SUMMARY OF COST EFFECTIVENESS SCREENING

	Alternatives Evaluated		
Factor	2C	10C	21
Cost	$4,923,481	$20,565,184	$15,661,848
Effectiveness	Moderate	High	Moderate
Reduction in Toxicity, Mobility or Volume	Low	High	Moderate

The costs for Alternative 10C are extremely difficult to estimate. The above costs have been prepared by the Dames & Moore for NL and Gould and are considered worst case costs assuming little of the material is recyclable. In particular, costs for disposal of non-recyclable battery components such as ebonite in a RCRA landfill are estimated at over $2,500,000 per year for five years. These costs also do not allow for any credit from the sale of recyclable components. Design costs for this project are estimated at only $226,000. EPA views these detailed cost estimates as providing a strong justification for increasing the amount of effort devoted to designing a process that minimizes the amount of material that requires disposal in a RCRA landfill.

Based on the analysis above, all of the above alternatives are considered to be cost effective ones. Each appears to provide an increase in effectiveness and reduction in toxicity, mobility or volume (both criteria evaluated together) that is commensurate with the increased cost. The basis for the ratings in this table is included in the detailed analysis that follows for these three alternatives.

Alternative 2C Evaluation

Alternative 2C comprises removal of the surface piles of battery casing fragments, followed by off-site component separation and recycle of some components, off-site disposal of others; lime treatment of the exposed surface soils and battery casing material, followed by low-permeability capping and revegetation; lime treatment of the East Doane Lake surface water; site grading; and a long-term monitoring program.

Short-Term Effectiveness. Under this alternative, most of the fill material would be left in place. During remediation, remedial action worker safety issues similar to those for minor earthmoving projects will arise. Hazards associated with site contaminants will be controlled by appropriate respiratory protection, proper safety attire and the application of dust suppression techniques. Therefore, the short-term risks for workers on-site would be negligible.

During remediation, lead concentrations in air emissions at the fenceline of the property will be monitored to detect any exceedences of the NAAQS for lead. Proper dust suppression techniques should minimize the likelihood of this event.

The surface piles carry the greatest potential for environmental risk because of their availability. Battery casing components contained in the surface piles will be transported to an off-site recycler for separation of components. After separation, some components will be recycled, while others may have to be disposed of in a landfill. Risks associated with transport of hazardous wastes from the site to the recycler, and hazardous waste transport from the recycler to a RCRA landfill, will be mitigated by transporting the wastes in accordance with 40 CFR 263 and State of Oregon requirements for hazardous waste transportation.

Alternative 2C could be executed in approximately one year, including planning, review, contracting and implementation.

The disadvantages of this alternative in terms of short term effectiveness are that significant quantities of hazardous materials remain at the site and there is potential exposure to these substances if the institutional controls proposed in this alternative are not effective. Secondly, the lime treatment proposed in this alternative has not been fully evaluated during the FS and therefore its effectiveness at this site is not well known.

Long-Term Effectiveness. Removal of the surface piles is expected to substantially reduce the potential for entrainment of dust from the site by wind, and to reduce the potential for human contact with site contaminants. Pumping and lime treatment of the site surface water may reduce the concentrations of dissolved contaminants by raising the pH of the water. Site grading will reduce the amount of runoff in East Doane Lake, and eliminate the transport of surface water off site. The application of lime to the surface areas where soil is exposed or where casings are exposed or buried may reduce the concentration of dissolved contaminants in surface runoff by raising the local pH. However, the effectiveness of this treatment technique at the Gould site has not been fully evaluated.

Subsequent capping will partially isolate the remaining contaminants, thereby reducing their availability for off-site transport by surface water, air and direct contaminant ingestion with soils. However, the location of the site in a 100 year floodplain, the problems with implementing institutional controls, particularly on the Rhone Poulenc and ESCO properties, and the fact that only 2% by volume of the contaminated casings will be removed make the long term effectiveness of this alternative questionable.

Reduction in Toxicity, Mobility, or Volume. Alternative 2C reduces the volume and toxicity of the site contaminants contained in surface piles, which are about 2% of the total battery casings. The mobility of contaminants in soil and subsurface casings may be reduced by increasing the pH of the soil system through lime treatment. Lime treatment may not be effective in preventing mobilization from groundwater moving underneath the site. Periodic reapplication of lime may be required to ensure the effectiveness of the treatment. Subsurface contaminants are not reduced in volume or toxicity.

Implementability. Equipment for separating the battery casing fill at the site is available. However, the separation equipment tested during the FS was designed to work on whole batteries, not on the mix of materials found at the Gould site. In particular, plastic and ebonite streams analyzed after processing through available separation equipment contained sufficient residual lead to fail the EP Tox test. Further, lead oxide is combined with much dirt in the separation process, which will serve to reduce the recyclability of this fraction. Alternative 2C would be accomplished using modified conventional machinery at an off-site facility.

Alternative 2C involves the removal and treatment of the surface piles of battery casings, surface soil treatment with lime, and surface water treatment by pH adjustment and filtration. Recovered battery casing components will be sent to other facilities for recycling or disposal. Those facilities receiving battery casing components will be required to meet RCRA Treatment, Storage or Disposal facility requirements for processing of hazardous wastes, as required by the EPA Off-Site Policy. Applicable DOT, EPA and State of Oregon regulations for the transport of hazardous materials will also have to be followed.

Any facility interested in accepting the lead compounds for the purposes of recovering the lead would have to be permitted as a TSD facility under RCRA. Recovered battery casing materials which cannot be recycled and which fail EP Tox will be disposed of in a RCRA landfill. Nonrecyclable materials which pass EP Tox may be disposed of in a sanitary landfill.

Cost. The costs associated with this alternative are divided into two categories. The first is capital cost which includes direct costs such as transportation, separation and disposal costs associated with the surface casings; surface water treatment costs; lime addition to soil; site grading; and installation costs associated with monitoring. Also included in capital cost are indirect costs such as permitting, engineering and design, start-up, and contingency. The second category of cost is operating and maintenance costs including site monitoring and reporting. Operating costs are discounted to present worth for comparison of alternatives.

	Capital Cost	O&M @ 12% Present Worth	Total Cost
Alternative 2C	$3,133,760	$1,789,722	$4,923,481

Compliance with ARARs. Contaminant-specific, location specific and action specific ARARs that apply to the Gould site are contained in Appendix A. All contaminant-specific, location-specific and action-specific ARARs will be met by Alternative 2C, except for the EP Toxicity requirement for lead in soils and battery casing materials. This alternative also allows a continual source of lead to impact the groundwater under the site, which already exceeds the MCL of 0.05 mg/l and is considered a Class II aquifer.

Overall Protection of Human Health and the Environment. Surficial contamination on site is reduced under Alternative 2C by removal of the surface battery casings piles and by paving/capping areas of highest residual soil contamination, with lime applied before paving/capping to further reduce the potential mobility of residual lead in subsurface soils. These measures will provide controls for general inhalation exposures and direct contact ingestion exposures in these areas of the site, barring physical disturbance of the pavement/cap. East Doane Lake surface waters will also be treated under Alternative 2C.

Assuming that the cap is not disturbed, on-site residential exposures by inhalation and ingestion result in hazard indices less than 1.00 for all age groups. On-site worker and off-site residential populations have even lower hazard indices for all exposure pathways evaluated. On-site and off-site air lead concentrations are in compliance with the NAAQS ARAR value. However, these values are based on the effectiveness of the cap and the institutional controls that would be required on the Gould, Rhone-Poulenc, and the ESCO properties. There is considerable uncertainty as to whether Rhone-Poulenc or ESCO would allow these types of institutional measures on their property. Should the cap become disturbed, substantially higher exposures for ingestion might result.

Short-term, off-site worker inhalation exposures from fugitive dusts generated during Alternative 2C remedial activities are determined to be non-significant, with a hazard index of 0.19. Maximum short-term (quarterly) air lead concentrations off site are projected to be in compliance with the NAAQS ARAR value.

Community Acceptance. Several letters were included in the record of public comment which clearly indicate that this alternative is not acceptable to portions of the community. For example, the Northwest District Association, which covers an area representing 12,000 residents, stated that it considers this alternative to be "totally unacceptable". Other groups that have expressed opposition to Alternative 2C include: Willamette Heights Neighbors Concerned About Noise and Chemical Pollution, Northwest Environmental Advocates, and OSPIRG. These responses are included in Appendix B.

State Acceptance. The State of Oregon Department of Environmental Quality (DEQ) has carefully reviewed this alternative and finds it unacceptable.

Alternative 10C Evaluation

Alternative 10C comprises excavation of all of the battery casing fragments and matte from the Gould property and adjacent properties, followed by on-site separation of the battery casing fragments. Separation is followed by recycling of those components (or portions of components) that can be recycled; off-site disposal for non-recyclable components that fail the EP Toxicity test, and on-site disposal of non-hazardous components. It is EPA's intent under this alternative to minimize the amount of material that would require disposal in a RCRA landfill. Treatment studies performed during design will be used to define what portions of the battery casings are recyclable.

Additional processes under Alternative 10C include excavation, fixation/stabilization and on-site disposal of contaminated soil, sediment and matte; soil capping of treated areas and revegetation; isolation of East Doane Lake by site regrading; and a monitoring program to determine changes in groundwater contamination over time. Under Alternative 10C, additional study will be performed on surface and groundwater in this area. The proposed study will help determine whether action needs to be taken to deal with the contamination underneath the site, and how that action should be coordinated with other cleanup efforts by nearby industries that are currently going on. The study will also address organic contamination as well as lead contamination. The study would begin later this year.

Short-Term Effectiveness. Beneficial effects of removing and successfully separating battery casings and fixing/stabilizing soils, sediments and matte will be immediate on completion. The groundwater and surface water monitoring program for Alternative 10C will be conducted as long as site contaminants remain unremediated.

During remediation, worker safety issues similar to those for moderate earthmoving projects will arise. For on-site workers, personnel protective equipment, including respiratory protection, will mitigate the safety concerns. However several activities will be conducted simultaneously in a relatively small area, leading to some concern over worker safety due to the intensive nature of site activity. As part of the remedial action, a comprehensive health and safety plan will be developed before field work begins.

During remediation, lead concentrations in air emissions at the fenceline of the property will be monitored to detect any exceedences of the NAAQS for lead. Proper dust suppression techniques should minimize the likelihood of this events. Most of the material to be remediated is currently saturated in groundwater, which will also help prevent fugitive emissions.

The completion of remedial activities under Alternative 10C may take up to 6 years after remedial design is complete. Site conditions that may delay execution of the alternative include logistical difficulties associated with dredging of the lake sediments. Requirements related to stabilization of the lake shoreline during deployment of dredging equipment may also serve to extend the time required for dredging. The estimate is based on a variety of factors that include the size of the facility and other items that will be evaluated during the design phase. It is the agency's intent to minimize the time that is required for remediation under this alternative.

Long-Term Effectiveness. Removal and successful separation of the battery casing fragments would substantially reduce sources of pollution at the site. Without the battery casings, levels of pollution in all media will decrease. Removal and disposal of contaminated sediments without treatment of the site surface water will raise the concentration of dissolved and suspended contaminants for a period of time.

Under this alternative, health and environmental hazards posed by the site are intensively addressed by treatment. Potential hazards posed by the site fill are addressed by treatment of the battery casing fragments. The treatment undertaken by this alternative addresses essentially all of the contaminated material and related risks. Risks remaining after remediation is completed are posed mainly by unremediated surface soils, ground water and surface water in the study area. The groundwater and surface water risks will be addressed in the additional study that is proposed under this alternative. Should the cap become disturbed, additional inhalation and ingestion risks might result. However, because of the intensive treatment employed in this alternative, these risks are considered to be less than those presnented in either Alternative 2C or 21.

The technology to be used in this alternative has been demonstrated in other situations and appears to be feasible based on the studies that have been done at this site, since the tests clearly showed that the materials c be separated. Design modifications of the separation process will be accomplished during the engineering studies that will occur as part of the remedial design phase.

Reduction in Toxicity, Mobility, or Volume. In the Nature and Extent of Problem section, the estimated quantities of metallic lead, plastic, lead oxide, ebonite, and other material are calculated. An estimate of the quantity of metallic lead is shown as 0.6 percent of all primary source materials, plastic is estimated at 3.0 percent of primary source materials, lead oxide/dirt/mud at 10.2 percent, and ebonite at 74.3 percent. Contacts made during the conduct of the FS indicate that the metallic lead would likely be completely recyclable, the plastic would be recyclable at some locations, depending on lead content, and lead oxide would likely be accepted by some smelters. The largest component of source material, ebonite, may or may not be recyclable depending on the extent to which it can be treated. Using these assumptions, it is estimated that approximately 25% of the lead in the casings can be recycled.

The potential for long-term mobility of site contaminants is decreased with Alternative 10C, by both removal of lead in the casings through recycling and by treatment of contaminated soils and sediment to reduce the mobility of lead.

Implementability. During the conduct of the FS, several efforts at component separation and cleaning of the battery casing material were attempted by the PRPs. A review of the efforts of others who attempted separation and recycle was also conducted. These attempts can be generally characterized as demonstrating that separation of battery casings is feasible at low feed rates.

Plastic and ebonite streams after processing may contain enough interstitial lead to fail the EP Tox test. All such materials that can not be recycled would need to be landfilled in a RCRA facility.

Soil stabilization is a proven technology and was shown to be effective in a bench-scale test during the FS. Pilot testing of the technology under actual site conditions will be required during remedial design to determine the correct ratios of materials and to determine whether the technique can be effective under actual site conditions.

Sediment dredging may contribute to the difficulty of subsequent treatment of East Doane Lake surface water, though some sedimentation of the suspended materials should occur prior to any future surface water remediation. Excavation of the fill on the Gould and off-site properties must also include a consideration of the power lines along the northwest edge of the Gould property, which may need to be relocated because of remediation.

Alternative 10C involves the excavation and separation of all battery casings, followed by recycle or RCRA disposal of specific battery casing constituents. Those recycle facilities receiving the lead oxide and soil component will have to meet RCRA TSD requirements for processing of hazardous wastes, as required by the EPA Off-Site Policy. Applicable DOT, EPA and State of Oregon regulations for the transport of hazardous materials will also have to be followed. No permit will be required for any of the wholly on-site portions of the alternative. During remediation, separation and treatment facilities will be erected, operated and demolished, and excavation equipment will be operated. These activities may require local construction permits.

Recovered battery casing materials which can not be recycled will be disposed of in a landfill. Components which fail the EP Toxicity test will have to be placed in a landfill that meets the RCRA requirements of 40 CFR Part 264. It is EPA's intent to minimize this portion of the separation plant output stream.

Cost. The costs associated with this alternative are divided into two categories. The first is capital cost, which includes direct costs such as erection of process equipment, excavation, separation and disposal costs associated with the surface and subsurface casings; sediment dredging costs, soil stabilization costs; site grading; and installation costs associated with monitoring. Also included in capital cost are indirect costs such as permitting, engineering and design, start-up, and contingency. The second category of cost is operating and maintenance costs that occur throughout the multi-year remedial effort, such as excavation, separation, and disposal costs beyond year one. Operating and maintenance costs are discounted to present worth for comparison of alternatives.

Capital Cost	O&M @ 12% Present Worth	Total Cost
$3,491,603	$17,073,581	$20,565,184

The costs for this alternative are extremely difficult to estimate. The above costs have been prepared by the Dames & Moore for NL and Gould and are considered worst case costs assuming little of the material is recyclable. In particular, costs for disposal of non-recyclable battery components such as ebonite in a RCRA landfill are estimated at over $2,500,000 per year for five years. These costs also do not allow for any credit from the sale of recyclable components. Design costs for this project are estimated at only $226,000. EPA views these detailed cost estimates as providing a strong justification for increasing the amount of effort devoted to designing a process that minimizes the amount of material that requires disposal in a RCRA landfill.

Compliance with ARARs. Contaminant-specific, location specific and action specific ARARs that apply to the Gould site are contained in Appendix A. All contaminant specific, location-specific and action specific ARARs will be met by Alternative 10C. During remediation, lead concentrations in air emissions at the fenceline of the property could exceed the NAAQS for lead. If continued excedences occur, remedial operations will be shut down and appropriate modifications to the operations will be made. Activities may also be adjusted based on meteorological conditions. All materials handling will be performed as a wet process where feasible. A site specific health and safety plan will be developed to ensure the safety of remedial action workers. Much of the material to be remediated is currently saturated in groundwater, which will also help prevent fugitive emissions.

Overall Protection of Human Health and the Environment. Surficial contamination on site is reduced under Alternative 10C by on-site treatment of all battery casings (piles and buried), with off- site disposal at a RCRA landfill of materials failing EP Toxicity tests and stabilization/on-site disposal of remaining residual materials (soil, sediment, matte), and pavement/capping of all disposal areas. These measures will provide long-term, effective controls for general inhalation exposures and direct contact ingestion exposures in these areas of the site. Stabilization of residual wastes will provide an additional component of protection and further prevent contaminant migration to groundwater.

Community Acceptance. In the public record there are several letters indicating support for this alternative. Groups that have expressed support for Alternative 10C include: Food Front Cooperative Grocery, Willamette Heights Neighbors Concerned About Noise and Chemical Pollution, Northwest Environmental Advocates, and OSPIRG. These responses are included in Appendix B.

State Acceptance. DEQ fully endorses this alternative and supports EPA's conclusion that Alternative 10C meets the statutory requirements for a remedy contained in CERCLA and Oregon Senate Bill 122.

Alternative 21 Evaluation

Under Alternative 21, all of the fill material on the Gould and off-site properties above 3000 ppm will be excavated for treatment (soil, sediments) or on-site disposal (battery casings). Contaminated soil, sediment, and matte would be treated by fixation/stabilization, then backfilled into the site excavation. Excavated battery casing materials would be disposed of in an on-site RCRA landfill. The alternative also includes pH adjustment and filtration of the East Doane Lake remnant, site grading, low-permeability surface capping, and a long-term monitoring program.

Short-Term Effectiveness. Under this alternative, the recovered battery casing fill would be stored on an adjacent property while the landfill is constructed. During remediation, worker safety issues similar to those for moderate earthmoving projects will arise. For on-site workers, safety attire will mitigate some safety concerns, however several activities will be conducted simultaneously in a relatively small area, leading to some concern over worker safety due to the intensive nature of site activity. As part of the remedial action, a comprehensive health and safety plan will be developed before field work begins.

During remediation, lead concentrations in air emissions at the fenceline of the property will be monitored to detect any exceedences of the NAAQS for lead. Proper dust suppression techniques should minimize the likelihood of this events. Most of the material to be remediated is currently saturated in groundwater, which will also help prevent fugitive emissions.

Remediation under Alternative 21 might be completed in about four years, including planning, review, contracting and construction.

Long-Term Effectiveness. The intent of this alternative is to fully mitigate potential health and environmental effects of site contaminants by completely isolating the contaminants from the environment. Enclosure of the battery casing fill in a RCRA landfill will prevent the migration of contaminants in water and air, and will limit their availability for direct ingestion. Fixation/stabilization treatment of soil, sediment and matte will also prevent contaminant migration and will decrease the mobility of these materials. Site regrading and blocking of the overflow from the East Doane Lake remnant will reduce the accumulation of runoff in the lake remnant, and decrease the movement of contaminated surface water off site. With appropriate institutional controls, the health and environmental hazards posed by the site fill are mitigated.

The removal and on-site disposal of the battery casing fill will require long term maintenance and monitoring. Frequent inspection of the cap will be required to ascertain that an impermeable barrier is maintained between the contaminants and the environment. Site monitoring equipment will require continued maintenance, as well. As a result, the effectiveness of leaving all of the contaminated battery casings untreated on-site is questionable, given concerns about the long term maintenance requirements of caps, the location of the site in a floodplain, and the effectiveness of institutional controls at this site.

Soil stabilization is a proven technology and was shown to be effective in a bench-scale test during the FS. Pilot testing of the technology under actual site conditions will be required during remedial design to determine the correct ratios of materials and to determine whether the technique can be effective under actual site conditions.

Reduction in Toxicity, Mobility, or Volume. On-site disposal of untreated battery casings cannot be considered a treatment that permanently or significantly reduces the toxicity or volume of hazardous substances. The mobility of contaminated soils is reduced by treatment.

Implementability. Soil stabilization is a proven technology and was shown to be effective in a bench-scale test during the FS. Pilot testing of the technology under actual site conditions will be required during remedial design to determine the correct ratios of materials and to determine whether the technique can be effective under actual site conditions.

Sediment dredging will contribute to the difficulty of subsequent treatment of East Doane Lake surface water. Excavation of the fill on the Gould and off-site properties must also include a consideration of the power lines along the northwest edge of the Gould property, which may need to be relocated because of remediation. Power supply to industrial facilities may be interrupted as a result.

Alternative 21 would be accomplished using conventional machinery and techniques. Surface capping is a proven technology, and is considered reliable. However, failure of a surface cap could require additional remediation, consisting of replacement of the cap.

During construction, monitoring systems will be installed, site drainage systems will be emplaced, and buildings will be demolished. Construction permits will be required for any off-site portion (i.e., drainage) of these activities.

During construction of the landfill, excavated wastes would have to be placed on an adjacent property. Temporary storage of excavated material must comply with 40 CFR 265.253 and 265.254. Off-site storage might also require special arrangements with state and local agencies and authorities, and special agreements with neighboring property holders.

The materials and equipment needed to implement Alternative 21 include a dredge for the sediments, common excavation equipment, a plastic geomembran for the landfill, water treatment equipment, monitoring equipment, and a source of lime and other reagents for fixation/stabilization. All of these materials are readily available.

Cost. The costs associated with this alternative are divided into two categories. The first is capital cost, which includes direct costs such as excavation and landfill construction costs; sediment dredging costs, surface water treatment costs; soil fixation/stabilization costs; site grading; and installation costs asso- ciated with monitoring. Also included in capital cost are indirect costs such as permitting, engineering and design, start-up, and contingency costs. The second category of cost is operating and maintenance costs that occur throughout the multi-year remedial effort, such as excavation, placement and monitoring costs beyond year one. Operating and maintenance costs are discounted to present worth for comparison of alternatives.

	Capital Cost	O&M @ 12% Present Worth	Total Cost
Alternative 21	$9,678,453	$5,983,396	$15,661,848

Compliance with ARARs. Contaminant-specific, location specific and action specific ARARs that apply to the Gould site are contained in Appendix A. Several action specific ARARs are particular to Alternative 21. These are indicated below:

- Landfill: must comply with 40 CFR 264 standards for a hazardous waste landfill.

- Capping: must comply with 40 CFR 264 Subpart G standards for a cover over hazardous waste at closure.

- Closure with waste in place: must comply with 40 CFR 264 Subpart G standards for closure performance and post-closure care and monitoring.

- Excavation: hazardous wastes excavated and replaced on-site must be replaced in a waste management unit that complies with RCRA requirements.

All contaminant-specific, and location-specific ARARs can be met by Alternative 21. During remediation, lead concentrations in air emissions at the fenceline of the property could exceed the NAAQS for lead. However, proper design of the materials handling process and proper dust suppression techniques should minimize the likelihood of these events. Much of the material to be remediated is currently saturated in groundwater, which will also help prevent fugitive emissions.

Action- specific ARARs for Alternative 21 can be met, with details to be worked out during remedial design.

Overall Protection of Human Health and the Environment. Surficial contamination on site is reduced under Alternative 21 by on-site treatment of all contaminated soils, with stabilization/on-site disposal in a constructed landfill of these materials and battery casing components. These measures will provide long-term, effective controls for general inhalation exposures and direct contact ingestion exposures in these areas of the site, barring physical disturbance of the RCRA landfill. Stabilization of residual wastes will provide an additional component of protection if the RCRA landfill is disturbed.

The long-term exposures and risks after completion of Alternative 21 remediation activities are determined to be acceptable. On-site residential exposures by inhalation and ingestion result in hazard indices less than 1.00 for all age groups. Should the landfill cap become disturbed, however, these exposures could increase.

Community Acceptance. During the public comment period, most of the comments were addressed to either Alternative 2C or 10C rather than Alternative 21. However, many of the comments expressed a desire for a "complete clean-up" of the site. To the extent that Alternative 21 fails to remove lead from the battery casings, community concerns about this alternative are assumed.

State Acceptance. DEQ's position regarding this Alternative is that the agency is opposed to any alternative that will increase the number of RCRA landfills in the State of Oregon. Since there is another cost effective alternative for this site, Alternative 21 is deemed unacceptable.

VI SELECTED REMEDIAL ALTERNATIVE

Description of Selected Remedy

The selected remedy for the soils unit at the Gould site is based on Alternative 10C. The selected remedy comprises:

- Excavation of all of the battery casing fragments and matte from the Gould property and adjacent properties where casings have been identified:
- A phased design program to determine the amount of material that can be recycled and to minimize the amount of material that must be RCRA landfilled.
- Separation of the battery casing fragments;
- Recycling of those components (or portions of components) that can be recycled, off-site disposal for non-recyclable components that fail the EP Toxicity test, and on-site disposal of non-hazardous, non-recyclable components;
- Excavation, fixation/stabilization and on-site disposal of the remaining contaminated soil, sediment, and matte;
- Soil capping and revegetation;
- Isolation of surface water runoff to East Doane Lake by site regrading; and
- A monitoring program to determine changes in groundwater contamination over time and to ensure that remediation does not adversely impact air quality.

Under Alternative 10C, additional study will be performed on surface and groundwater in this area. The proposed study will help determine whether action needs to be taken to deal with the contamination underneath the site, and how that action should be coordinated with other cleanup efforts by nearby industries that are currently going on. The study will also address organic contamination as well as lead contamination. The study should begin later this year and will be accomplished under a strict schedule.

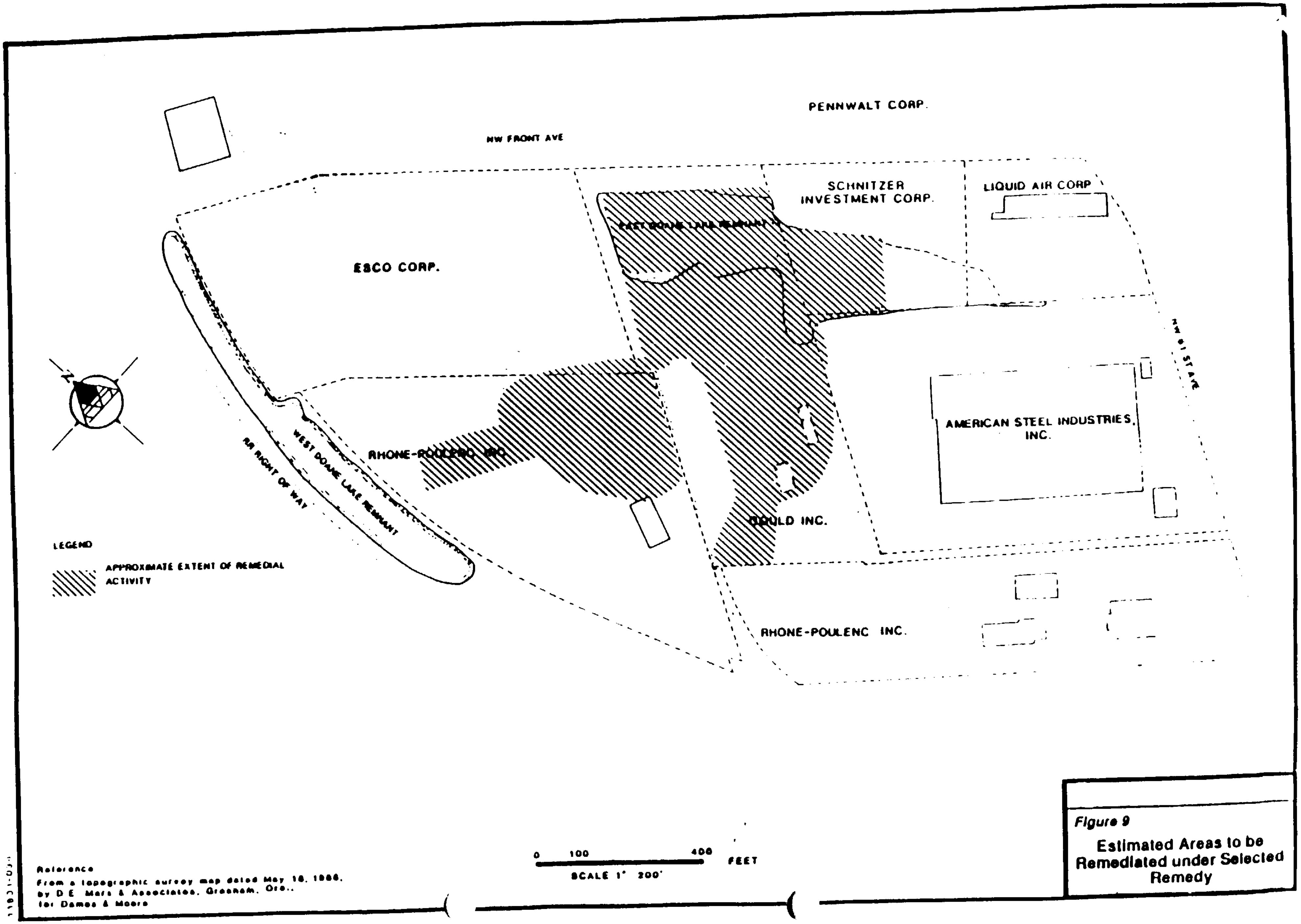


Figure 9

Estimated Areas to be Remediated under Selected Remedy

Surface soils that have a total lead content above 1,000 ppm, and sub-surface soils, matte, and the East Doane Lake sediments that fail EP Toxicity standards; will be removed and treated with a fixation additive to bind the lead in the soils matrix. The stabilized product from the soils process will be backfilled, graded, and recompacted on site. Topsoil and a vegetative cover will be placed over the backfill to prevent weathering of stabilized soil and subsequent remobilization of the metal components. Battery casings which are recyclable will be excavated and treated to separate the component materials such that they can be recycled. Output streams from the separation facility that are not recyclable, and that fail the test of EP Toxicity for lead are required under RCRA regulations to be disposed of in a RCRA landfill.

EPA intends to devote extensive design effort to developing a process that will minimize the amount of material that will require disposal in a RCRA landfill. If based on the results of the design phase, it appears that the goals of treating all of the battery casings and minimizing the amount of material requiring RCRA disposal are not compatible, an additional public comment period will be established, and the Record of Decision may be amended. At such time, EPA would present to the public other options for dealing with the treated materials.

Those output streams that cannot be recycled but pass the test of EP Toxicity, will be disposed of on site, and covered with topsoil.

The outfall of East Doane Lake will be blocked such that water that fails the Oregon Water Quality Standard for lead will not be discharged to the Willamette River. The processes and unit operations under the selected remedy are described below. The areal extent of remediation under the selected remedy is depicted in Figure 9.

Battery casings will be excavated and then delivered to a stockpile located adjacent to the battery casing treatment plant. The contaminated soils, sediments and matte will be removed and stockpiled adjacent to a soils treatment facility. The estimated in-situ casing and contaminated soil quantities are as shown in the following table.

	Volume (cu yd)	Mass (tons)
Surface Soils	3,370	4,300
Sub-surface Soils	13,650	17,500
Sediments	5,500	7,520
Matte	6,000	12,000
Battery Casings	80,800	86,820

The contaminated soils will be transferred to a stockpile formed adjacent to the soils treatment facility. Soils which will not be treated but were removed for ease of access and slope stability will be stockpiled and later used as backfill. This volume is estimated to be 17,800 cu. yd.

The treated soils will be back hauled to the excavation, then graded and compacted in lifts suitable for the soil type. The site will be graded to have swales and slopes to provide soil stability, drainage, and prevent run-on from adjacent areas. Top soil will be imported to provide a four-inch soil cap with a vegetative cover to prevent weathering and subsequent airborne migration.

In addition to the earthmoving required on the Gould site, the northeast section of the American Steel Industries parking lot, which drains to the lake, will require modification to reroute drainage from that facility.

To prevent excess airborne migration during surface and subsurface excavation of material, dust control by watering and other measures will be practiced as required. In addition to watering, these activities could include reduced vehicle speeds; reduced drop heights; and special enclosures and controls for conveyors. Additional design modifications may also be required to ensure that fugitive emissions are kept to a minimum. Site boundaries will be monitored to determine if air emissions of lead exceed the NAAQS. If continued excedences occur, remedial operations will be shut down and appropriate modifications to the operations will be made. Activities may also be adjusted based on meteorological conditions. A site specific health and safety plan will be developed to ensure the safety of remedial action workers.

The excavation of subsurface battery casings and subsequent treatment will result in an extension of East Doane Lake in the Gould property, in the Rhone-Poulenc property, and on the ESCO property. To prevent erosion, the excavation will be graveled at the shoreline and coarse gravel will be spread and graded above and below the waterline.

A treatment facility will be constructed at the site to treat contaminated surface soils, subsurface soils, sediment and matte. A typical process for treating soils consists of a comminution system to reduce the materials to a relatively uniform size, and then pugmilling with an additive to bind the metals in the soils matrix.

In the pugmilling section, the process commences at the feed hopper. Stockpiling, retrieval, material handling, and circulating loads in the crushing circuit provide a uniform blend of feed material to the pugmill. In the pugmill the feed is joined with binder additive and a predetermined amount of water, then fed to the pugmill as a water based slurry. In the pugmill the additive is driven into the soils. The additive comprise of a cement-like fixative (cement, pozzolan, lime, clays); a reducing agent, and various proprietary chemicals. The actual additive composition and its ratio will be determined by pilot testing during the design phase. The pugmill discharges the stabilized soil to a belt conveyer which transports it to a stockpile from where it will be retrieved by loader for backfilling.

A treatment facility will also be constructed at the site to treat the contaminated battery casings and produce potentially recyclable products or a reduction in material to be subsequently disposed. The process includes a comminution system to reduce the materials to a size at which they can be separated. This is followed by a series of hydroclassifiers which separate the various products in water by the differential specific gravities. Separation is performed as a function of material specific gravity and detention time in each classifier. The quantities, specific gravities, and loose bulk densities of each of the casing components are estimated to be the following:

Component	Specific Gravity	Bulk Density (lbs/cu.ft.)	Volume (cu. yd.)	Mass (tons)
Ebonite	1.40	61.21	77,642	64,148
Plastics	0.94	41.90	5,162	2,920
Met. Lead	11.34	267.73	136	493
Oxide/Mud	5.65	214.54	3,059	8,860
Rock/Slag	2.20	95.01	2,313	2,966
Other	1.50	67.00	1,405	1,268
Moisture	1.00	62.30	0	6,175
Average/Total	2.15	71.68	89,717	86,827

The actual volume of casings to be treated will be determined after additional design work to further define the locations of battery casings underneath the site and determine the characteristics of the subsurface casings/soil matrix that can be recycled.

It is also assumed that both the soils treatment and battery recycling plants will operate concurrently.

The separated materials from the battery separation facility will be ebonite, plastic, metallic lead, and a combined stream of lead oxide/mud. Based on the results of pilot studies it is assumed that all of the metallic lead, half of the plastic, and 25 percent of the lead oxide/mud will be potentially recyclable. Any of the ebonite, plastic, lead oxide/mud streams that fail EP Toxicity will be sent to an off-site RCRA landfill. Materials that pass EP Toxicity but which can not be recycled may be left on site. These amounts will depend on the the results of the separation step.

Rock/debris and other similar materials separated from the recycling plant feed stream will be sent to the fixation plant and treated with the soil for backfilling.

The end product of soil stabilization treatment will be tested for the appropriate physical and chemical characteristics. The design of the testing procedures will be developed after the pilot testing and selection of the particular stabilization technique. The testing program would determine treated and untreated soil properties such as porosity, permeability, wet and dry densities, particle size distribution, bulk properties, and durability. Chemical leach testing of stabilized soil, including EP Toxicity tests, will be done to predict its chemical stability.

Design Studies

A major feature of this selected remedy is the design work that will be required before the remedy can be implemented. As discussed earlier, EPA intends to devote extensive design effort to developing a process that will minimize the amount of material that will require disposal in a RCRA landfill. The design work will consist of a phased series of studies to:

- Define recyclability criteria for the subsurface casings that will be used to determine the volumes of subsurface casings that can be recycled.
- Determine the process requirements to separate the casing components in a manner that minimizes fugitive emissions. Depending on the results of initial evaluations under this step, large quantities of surface casing material may be transported to an off-site facility for recycling and equipment modification studies.
- Determine the modifications required to adapt existing separation technology to conditions at the Gould site.
- Determine the process requirements for treating contaminated soils, sediment and matte.

Additional Study

Under the selected remedy, additional study will be performed on surface and groundwater in this area. At present, EPA believes that the information currently available on the surface and groundwater at the site is insufficient to make a decision on remediation of those areas. The proposed study will help determine whether action needs to be taken to deal with the contamination underneath the site, and how that action should be coordinated with other cleanup efforts by nearby industries that are currently going on. The study will also address organic contamination as well as lead contamination. The study would begin later this year. EPA has notified several companies in the Doane Lake area that they may be responsible for this contamination and will be working with them to do the study.

Monitoring

The monitoring program will consist of airborne monitoring during the construction and operation period as required to ensure that the selected remedy is protective of public health and the safety of remedial action workers; and long term groundwater/surface-water monitoring. The groundwater and surface water monitoring results will be used as needed to determine whether any addition remedial measures are required for these areas.

Institutional Controls

The institutional controls that would be available to prevent contact with contaminated ground or surface water during and after remediation include site access restrictions, restrictive covenants, deed restrictions, property transfer restrictions, conveyance of subsurface rights to a third party, and private third-party agreements. A choice of the correct combination of controls to apply to the remedy during remediation will be made during remedial design. Additional post remediation controls will be determined after remediation.

Performance Standards

Soil Stabilization and Capping - Surface soils with a total lead concentration above 1,000 ppm; and subsurface soils, sediment, and matte which fail EP Toxicity standards will be treated as described above. Laboratory experiments will be performed to ensure that the stabilization process effectively immobilizes the contaminants. Stabilization will be deemed effective if the following tests are met:

1) The leachate generated during the EP Toxicity test does not contain contaminants in excess of the levels required to pass the test.

2) The stabilized material passes standard engineering strength tests to be determined in the design phase.

The cap shall be designed and maintained to provide protection against surface exposure of humans or animal or plant life to the stabilized soil contaminants, and protect this material from weathering. A four inch soil cover will be placed over the stabilized material and revegetated.

The stabilized material cap must also meet the following design requirements of 40 CFR 264.310.a: 1) function with minimum maintenance; 2) promote drainage; and 3) accommodate settling and subsidence so that the cap's integrity is maintained.

<u>Battery Casings Separation</u>. All battery casings material that fails EP Toxicity standards and passes recyclability criteria developed during the design studies will be processed in the separation facility.

Output feed streams from the separation facility must meet the following criteria:

1) Lead and lead oxide streams must meet the requirements of RCRA regarding recyclability.

2) Ebonite and plastic streams must pass EP Toxicity requirements.

Output streams which do not pass these criteria will require transportation to a RCRA landfill that meets the requirements of 40 CFR 264, and EPA's off-site policy.

<u>Statutory Determinations</u>

As discussed in the detailed evaluation of alternatives, the selected remedy is protective of human health and the environment. Surficial contamination on site is reduced under Alternative 10C by on-site treatment of all recyclable battery casings (with volumes to be determined during design); with off- site disposal at a RCRA landfill of materials failing EP Toxicity tests and stabilization/on-site disposal of remaining residual materials; and pavement/capping of all disposal areas. These measures will provide long-term, effective controls for general inhalation exposures and direct contact ingestion exposures in these areas of the site. Stabilization of residual wastes will provide an additional component of protection and help prevent further long term contamination of the groundwater underneath the site from these wastes.

The selected remedy also attains ARARs for the soils unit considered in this ROD. These ARARs are specified in Appendix A. All contaminated casings and soils will be treated to ensure compliance with the EP Toxicity standard of 5 mg/l.

In comparison with the other alternatives which pass the Protectiveness/ARAR screening, the selected remedy provides a level of effectiveness and reduction in toxicity, mobility or volume that is commensurate with its cost; it is therefore cost effective. Because the remedy is considered to be the optimal choice when all nine evaluation criteria are used, it is also considered to represent treatment to the maximum extent practicable for the soils unit at this site. The selected remedy, in treating all the contaminated casings and soils, also satisfies the preference in CERCLA for treatment as a principle element.

APPENDIX A
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

APPENDIX A
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
LAWS AND REGULATIONS TO BE CONSIDERED

A. FEDERAL LAWS AND REGULATIONS THAT ARE ARARs FOR THE GOULD SITE

- Resource Conservation and Recovery Act (RCRA) (42 USC 6901), Subtitle C:

  EP Toxicity Standards for lead, cadmium, chromium, zinc.

  Landfills: must comply with 40 CFR 264 standards for a hazardous waste landfill.

  Capping: must comply with 40 CFR 264 Subpart G standards for a cover over hazardous waste at closure.

  Closure with waste in place; must comply with 40 CFR 264 Subpart G standards for closure performance and post-closure care and monitoring.

- Clean Air Act (CAA) (72 USC 7401):

  National Ambient Air Quality Standards for lead.
  Ambient Air Quality Standard 1.5 ug/m3 lead

  arithmetic average concentration of all samples collected during any one calendar quarter period.

- OSHA 29CFR 1910:

  Regulations governing worker safety at hazardous waste sites.

Other Action Specific ARARs

The following ARARS will be used for any wastewater discharges from remedial actions at the Gould site.

- Safe Drinking Water Act (SWDW) (42 USC 300):
  Drinking Water Standards (40 CFR 141), including maximum contaminant levels (MCLs).

- Clean Water Act (CWA) (33 USC 1251):
  National Pollutant Discharge Elimination System (40 CFR 122)
  Water Quality Criteria (EPA440/5-86-001).